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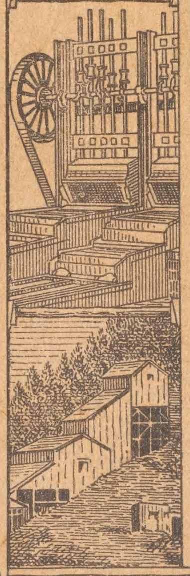

Issued by the Mining
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Mines Department, under the direction of the
HON. A. J. CADMAN, MINISTER OF MINES.

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C.H. PIERARD. DEL.

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JOHN MACKAY, GOVERNMENT PRINTER.

THE
New Zealand Mines Record.

VOL. I. DECEMBER 16, 1897. No. 5.

NOTES FROM THE MINES.

HAURAKI GOLDFIELDS.

Coromandel.

Royal Oak of Hauraki.—This company, with which the Tokatea was a few months ago amalgamated, are pushing on vigorously the development of their mine, with very satisfactory results. Some rich specimens have been lately obtained from their lowest level, or 160 ft. below the Tokatea main adit-level. The lead is about a foot in width in the face of the drive at the 160 ft. level, and carrying minerals for a run of gold. Work on the lead is proceeding on the upper levels; and, although they are not producing a large quantity of crushing materials, they are making up for it in quality—17 tons and 1,401 lb. of specimens crushed during the past month giving a return of 1,699 oz. 5 dwt. of gold, value £4,262 5s. 8d.

Hauraki Main Reefs.—This company have sunk a shaft to a depth of 180 ft. on the beach below high-water mark, and levels are being driven north and south from the bottom of the shaft for the purpose of intersecting the Pah Reefs, or any others that may traverse the property; but, so far, nothing of importance has been discovered.

Kathleen.—Twenty-six men are employed in developing this company's mine. The south cross-cut is in a distance of 450 ft. from the shaft, and driving is proceeding on the Hauraki, Carlyon's, and Hartridge's Reefs at the 200 ft. level. The dimensions of these reefs varies considerably, from 6 in. to 7 ft. in width. Nothing has yet been discovered in this company's property of a payable nature, but the claim is closely situated to mines that have yielded rich returns.

Karaka Block.—A reef 4 ft. in width has lately been found on this block, and is likely to be of considerable importance to the district. The find is situated about three-quarters of a mile to the south of the Success Company's battery. The quartz is of a kindly description, and contains a larger quantity of mineral than is generally found in stone taken so near the outcrop. The reef has been traced for a considerable distance, and fair prospects of gold have been got by crushing the stone obtained at different places along the outcrop. A cross-cut drive is being put in from the side of the hill for the purpose of intersecting the reef at a point about 80 ft. below the outcrop. The mine can be opened up at a small cost by adit-levels from the side of the hill, and there are good facilities for a crushing plant, as there is a stream of water in close proximity to the mine.

Success.—Twenty-nine men are employed in driving and stoping on the various leaders that traverse the property, and prospecting operations are also being carried on. As the leaders are small, only a limited quantity of crushing material is obtained.

New Hauraki.—The work in progress consists of prospecting the mine by driving and surface trenching, at which twenty-four men are employed. This property is close to the Karaka Block and Success Mine.

Puru.

Puru Consolidated.—A considerable amount of work has been done on this company's property. No. 1 level has been driven a distance of 300 ft. on the reef, and No. 2 level 400 ft., while a good deal of cross-cutting and trenching on the surface has been effected. It is intended to put in the main drive 200 ft. lower down the hill than the No. 2 level, and at the low level the top terminus of the aërial tramway will be fixed to convey the quartz to the battery. Tests made from the reef, which averages 18 in. in width, have been of such a satisfactory nature that the company intend to erect a crushing plant to treat the ore. Five men are at present employed in the mine, six men are excavating a site for the battery, and six men are sawing timber for the water-race, flume, battery, &c.

Tararu.

Argosy.—A parcel of quartz from the main drive was lately tested at the Thames School of Mines by Mr. F. B. Allen, the director. The quartz was semitransparent, carried carbonate of lime, and showed gold in dabs. 360 lb. of the dry-crushed ore yielded, on amalgamation in pans and grinding in berdans, 8 oz. 13 dwt. 8 gr. of melted bullion, worth £2 14s. 8½d. per ounce, or at the rate of £147 11s. 4d. per ton. It is probable that a small battery will be erected, so as to more thoroughly test the ground.

Tairua.

New Zealand Broken Hills.—This company have forty-three men employed. Operations are at present confined to extending an intermediate and low level to reach a point under the place where rich gold was obtained in the surface-levels. The low level is in a distance of 654 ft., and the intermediate 476 ft. A good deal of work has been done in opening up the lode at the surface-levels, and a large quantity of the material obtained contains gold in payable quantities, but as yet the reef is not well defined, and it would be hazardous to describe its course or true dip. Samples assayed from it have given good results. The erection of a twenty-stamp mill is to be commenced immediately, and the construction of the water-race, which will be 2 miles 4 chains in length, is being vigorously proceeded with. The race is estimated to carry fourteen sluice-heads of water, and will have an effective fall of 100 ft., capable of driving a large crushing plant.

Hikutaia.

Hikutaia Gold Syndicate.—This company's mine is well opened up. The reef, which is from 6 ft. to 14 ft. in width, has been driven on at No. 5 level for a distance of 1,250 ft., and 600 ft. at the bottom level. A good deal of work has also been done in driving and prospecting the reef at the surface levels. Communication has been effected between the different levels, and the ventilation is all that can be desired. The ore, though of a low grade, contains sufficient bullion to leave a small margin of profit, and there is enough quartz in sight to keep a 100-stamp mill going for years. Thirteen men are employed in the mine.

Whangamata.

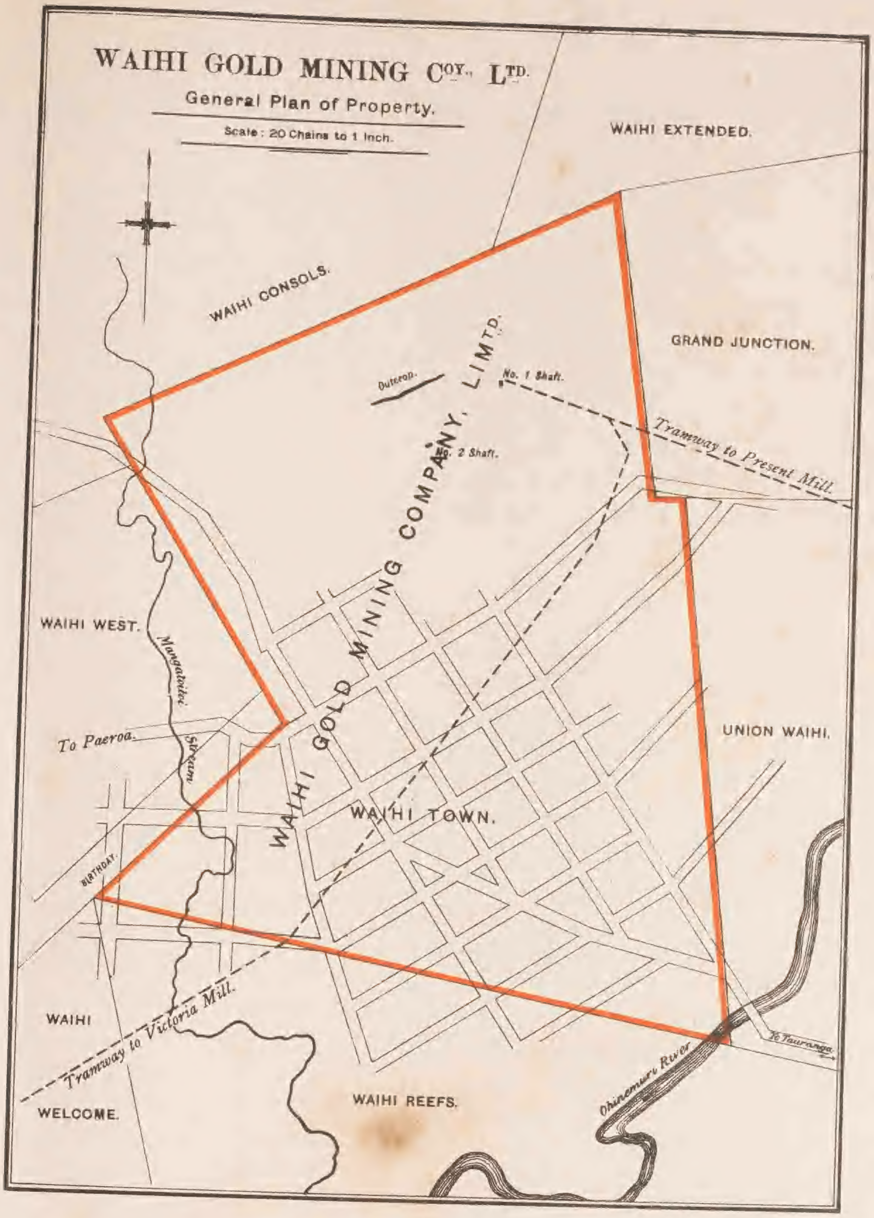
Whangamata Proprietary.—This company, who employ forty-five men, have done a considerable amount of work in the shape of driving, sinking, prospecting, and road-making. The No. 1 level has been driven a distance of 721 ft. on the course of the reef. About 100 ft. back from the face of the drive a slide, composed of clay and disjointed country, was met with, which had the effect of cutting out the reef, but pieces of quartz are frequently met with in this formation which give good assay results. The same break was cut in the surface drive, but the reef has been picked up on the other side of the break at this level, and it is likely the same thing will occur at No. 1 level. The No. 2 level is in a distance of 548 ft., the drive going along the reef for nearly the whole of the distance. The reef, which varies from 2 ft. to 12 ft. in width, is passing through good country, and can be easily worked, as it is of a friable nature, and the quartz of a kindly description for gold. Winzes have been sunk on the reef from No. 1 to No. 2 levels, and a shaft is now being sunk from the outcrop on the top of the hill, for the purpose of giving ventilation and facilitating operations at the different levels as the work proceeds. Cross-cut drives have been put in at different levels, and a great deal of prospecting work has been done on the property. Assay tests of stone taken from the reef from time to time have given favourable results. The plans of a crushing-plant have been prepared and the machinery ordered, and the erection of it will be commenced as soon as it can be got on to the site.

Wharekiraupunga.

Royal Standard.—This company have 85 men employed. The principal works in progress are driving on the reef at Nos. 1, 2, and 4 levels. The reef varies from 4 ft. to 20 ft. in width, and tests made from time to time have been very satisfactory. The tramway formation of 4 miles 52 chains is nearly completed from the battery-site to the landing, and the rails will shortly be laid down. The water-race formation and battery-site are nearly completed, and as soon as the tramway is finished the erection of the crushing-plant, &c., will be at once taken in hand.

Waitekauri.

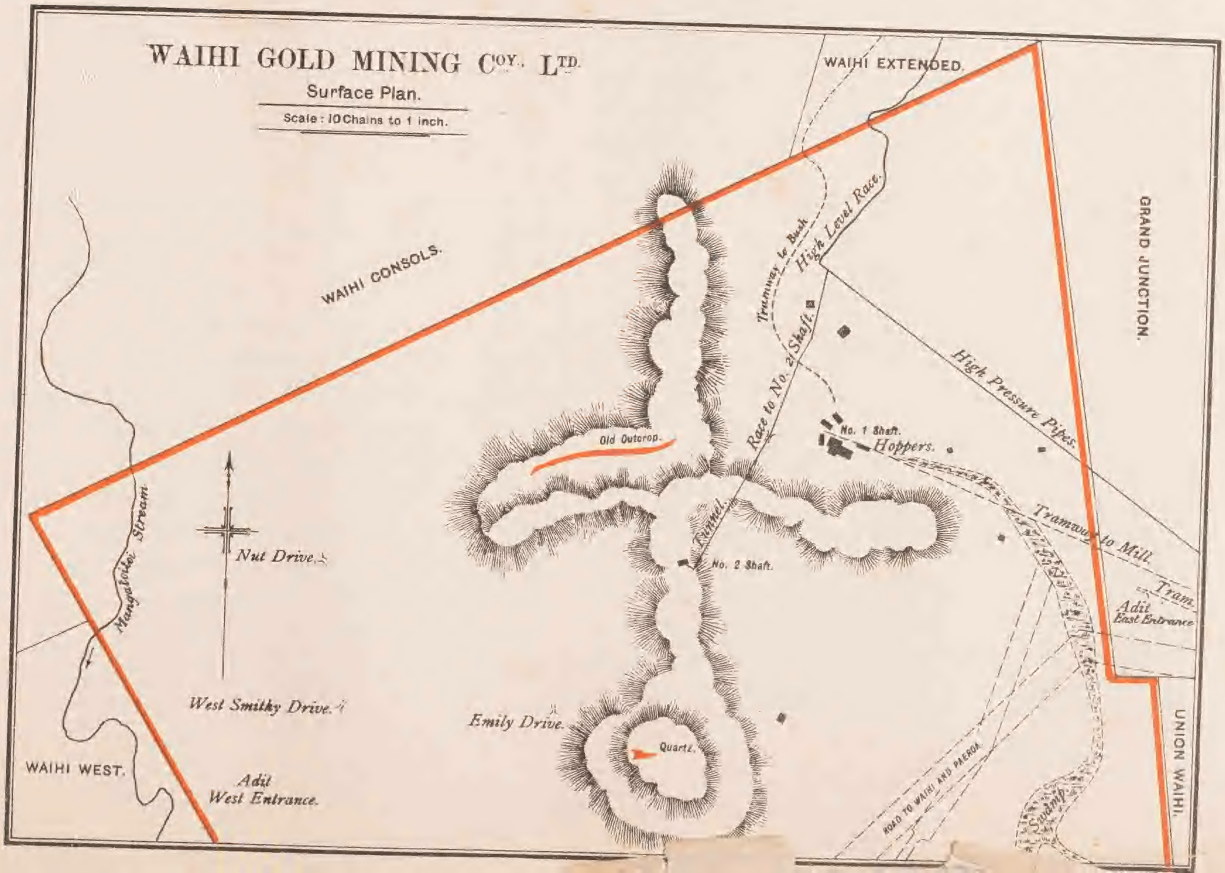
Waitekauri. — This company have decided to thoroughly prospect and develop the Te-Ao-Marama section of their property, where there are twenty-four men now at work; but this number is likely to be largely increased, as the manager is having a site excavated on the side of the hill at the intermediate level, preparatory to sinking a shaft to a depth of 600 ft. When that depth is attained it is intended to open out and drive to meet the low level which is being driven from the Grace Darling Creek. Drives will also be opened out at different levels in the shaft for the purpose of opening up the various reefs in this section of the property before communication is effected with the low level and the battery, so that no time will be lost, when the tunnel is completed, in getting the quartz to the mill, the prospects met with in this section of the property being sufficiently en-



WAIHI GOLD MINING C^{OY}. L^{TD}.

General Plan of Property.

Scale: 20 Chains to 1 Inch.



WAIHI GOLD MINING C^{OY}. L^{TD}.

Surface Plan.

Scale: 10 Chains to 1 inch.

couraging to warrant pushing ahead this important work. The Golden Cross section is still producing a large quantity of payable ore, 1,945 tons treated last month yielding bullion to the value of £4,077 2s. 6d. The whole of the company's properties are being systematically developed, and a large number of men are employed. When the mine is thoroughly opened up, and the connections with the battery are completed, it is anticipated that the production of bullion will be increased to such an extent as to enable the company to declare substantial dividends.

Waitekauri Extended.—This company are erecting a forty-stamp battery, together with cyanide-vats and some of the latest appliances for saving gold; but in the meantime the directors gave instructions to commence crushing with twenty heads. The battery is connected by an aërial tramway, which runs to the kilns, a distance of a mile and a half; and a ground tramway is laid from the kilns to the mine, a distance of one mile, but later on this will be superseded by an aërial tramway. A considerable amount of work has been done in opening up the mine and driving on the reef. There is a large body of ore, varying in width from 6 ft. to 60 ft. Whilst driving on the reef tests of the quartz are taken frequently, and in most cases have given payable results. There has been a large outlay in road-making, tramway construction, battery erection, &c., as well as in opening up the mine, but the prospects have been considered sufficient to warrant the expenditure. Fifty-four men are at work in the mine, and there were twenty-six men engaged in the works in connection with the battery.

Waitekauri Cross.—Sixteen men are employed in prospecting and driving on the main reef, which varies from 20 ft. to 60 ft. in width. The ore is of a low-grade character, although some good tests have been taken from portions of it. The manager intends to sink an underlay shaft on the reef to prove its value at a lower level.

Komata.

Komata Reefs. — This company's mine is well opened up, and there should be no difficulty in keeping the battery constantly at work, as the main reef is 8 ft. in width, and Argall's lead is 2 ft. The battery is situated a mile and a half down the Komata Creek from the mine, and the ore is conveyed to the mill by ground tramways. Everything in connection with the mine and battery is working smoothly. The first clean-up of 1,000 tons gave a very satisfactory return of bullion, the value being £3,300.

NELSON-WESTLAND GOLDFIELDS.

Collingwood.

Quartz Ranges Crushing and Sluicing Company.—This company, whose head office is in London, have a capital of £35,000, and hold an area of 300 acres, about twenty-two miles west of Collingwood— seventeen miles and a half by main road, and the remainder of the distance by tramway, in the construction of which there are eighteen men employed. The water for sluicing will be taken from the Boulder River and Lake, and conveyed by flume for a distance of four miles and a half, the quantity of timber required for the fluming being 700,000 ft. In addition, 2,200 ft. of pipes, 2 ft. 4 in. in diameter, will be required. The altitude of the river, at the point where the water is to be obtained, is 1,600 ft., and the altitude of the sluicing-face 1,200 ft. The company have a large number of men employed, and are erecting a sawmill to cut all the timber required for the mining operations, houses, offices, &c. The works are under the management of Mr. F. G. Mace.

Red Hill Syndicate.—The area held by this syndicate is 100 acres, six miles south-west of Collingwood. A tunnel has been driven a distance of 680 ft. Different leaders were met with near the edge, and gold can be seen in some of the quartz close to the mouth of the tunnel.

Parapara Hematite-works. — The hematite-works, owned by Messrs. Washbourne, are situated on the Parapara Stream, six miles from Nelson. They have a six-head battery, each stamp being 750 lb. in weight, with berdans, drags, &c., the motive-power being supplied by a water-wheel 30 ft. in diameter. The output is about 80 tons per annum, and the hematite, which is put up in 28 lb. and 56 lb. bags, finds a ready sale in Nelson at £12 per ton. Preparations are now being made for the manufacture of a knife-polishing powder. Five men are employed.

Golden Ridge Mine.—No. 1 level has been driven along the reef, which averages from 1 ft. to 4 ft., about 400 ft., and the quartz is stored at the mouth of the drive ready for the mill when required. In the No. 2 level a cross-cut has been put in 50 ft. through a mixture of sandstone and slate. The drive along the reef is about 360 ft. The reef, which carries a very good foot-wall the greater part of the way, varies in width from 1 ft. to 5 ft. The reef is north-north-west by south-south-east, with a strong underlie to the west. There are twelve men employed in the two drives, which are well timbered and ventilated by a rise from No. 2 to No. 1 level, the distance being 50 ft. The quartz from these workings are stored in a paddock ready for crushing. The battery, which is nearly completed, will have twenty stamps, each 9 cwt., and four 4 ft. 6 in. berdans. The plant will be a very complete one, and the building is of a substantial character. The motive-power is to be water, and all the fluming has been completed. The water will be brought in through a tunnel 999 ft. in length, driven simultaneously from the east and west, twelve men being employed, and the air for the tunnel is supplied by a water-blast. The aërial tramway is nearly completed. The works are being carried out under the superintendence of Mr. Richmond Hursthouse, the general manager of the Golden Ridge Gold-mining Company.

Taitapu Gold Estates.—On the No. 2 block, where twelve men are employed underground and two men on the surface making tracks, the outcrop of the reef can be traced for three miles, and is in the same auriferous belt as the Golden Ridge Mine. The reef has been tested by a winze 125 ft. in depth, and it was found to average from 4 ft. to 6 ft. in width. No. 1 cross-cut is in 100 ft. to where the reef has been intersected ; it has been driven north 250 ft. and south 100 ft. The quartz is stacked at the mouth of the drive and top of the winze ready for the mill. In the No. 3 block the outcrop of the reef is 5 ft. wide, and pieces broken from it showed gold freely. No. 1 cross-cut is in 120 ft. The reef, where intersected, is 4 ft. wide, and lying very flat. It has been driven 120 ft. south and 147 ft. north. The reef is from 4 ft. to 6 ft. wide, with a good foot-wall, and prospects well. The No. 2, or low-level, cross-cut is in 310 ft., and, as the ground is very wet, it is expected that the reef will shortly be met. The ventilation is supplied by a water-blast having 120 ft. of fall. Twelve men are at work on this section, and eight men prospecting for outcrops of reefs. There are 126 men employed by the company on the various works in hand. Mr. F. H. Johnston has charge of the operations of Nos. 2 and 3 blocks. There are three other companies—the Australian Gold Trust, Pioneers of New Zealand, and the London-West Australian Syndicate—prospecting on the company's property, and are reported to be meeting with very encouraging results

Rocky River Sluicing Company.—This company, whose head office is in Auckland, hold an area of 100 acres, nineteen miles south of Collingwood, the workings being at an altitude of 1,200 ft. Water for sluicing is at present obtained from McKenzie's Creek, but a survey has been made for a larger race, to be taken from the Rocky River, and the pipes are being made in Nelson.

A large quantity of gold has been obtained in this district from time to time. There are six private parties now at work, making good wages. The gold is coarse, and a piece weighing 16 dwt., with small particles of quartz attached to it, was recently picked up. On the top of the range (locally known as "The Castles") there is a large quantity of gold-bearing cement, with a thick layer of limestone underneath.

Addison's Flat.

The Golden Sand property is largely owned by an Auckland syndicate, who have erected a ten-head battery. The stamps and all the machinery, which were manufactured at the Despatch Foundry, Greymouth, appear to be substantially built, and had a very successful start. The cement is brought up to the mill on an incline tramway, the motive-power being supplied by a 12 ft. water-wheel, and for the battery by a 6 ft. Pelton. The cement to be operated on is of a very large extent, the area being about 300 acres, and in the present face it is 8 ft. thick. Twelve men are employed.

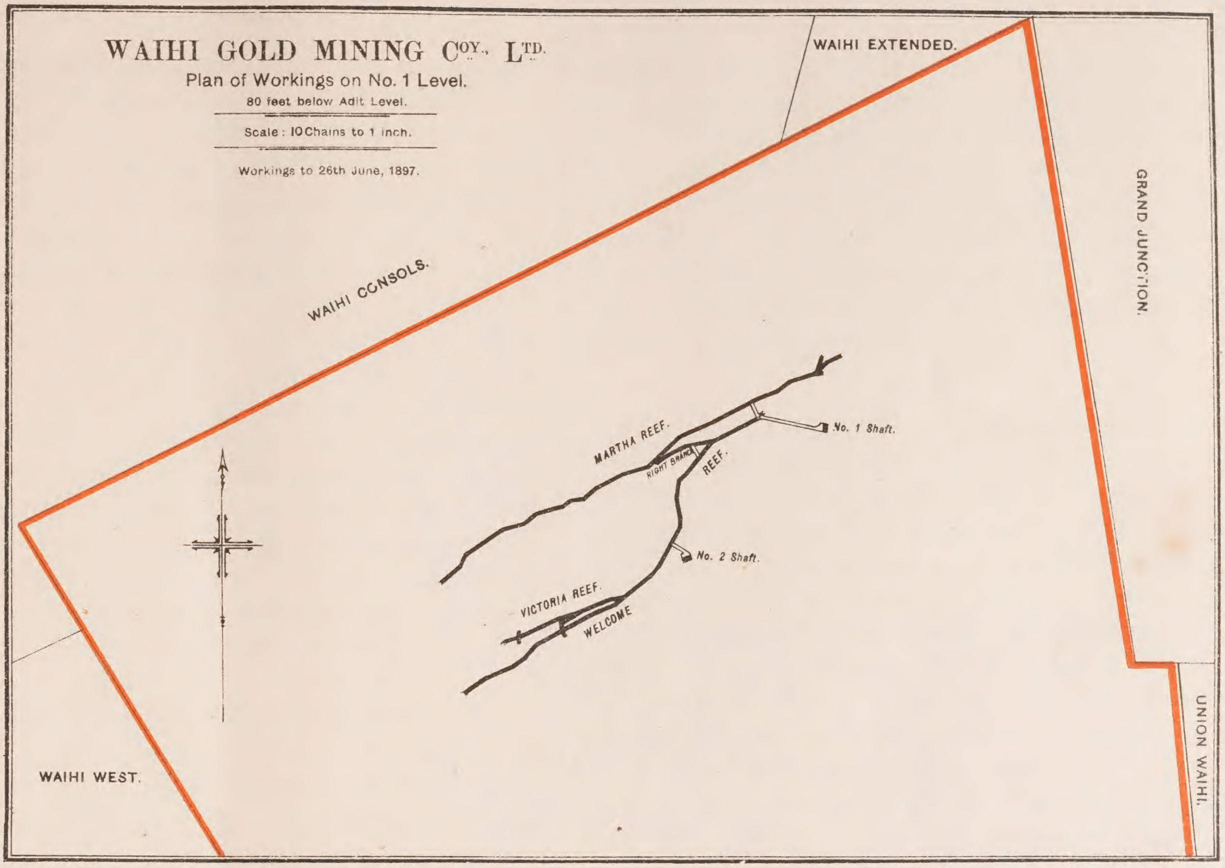
The Venture property is owned by a local syndicate, who employ eight men. The battery, consisting of twelve stamps, 4 cwt. each, has been at work for some years, a water-wheel, 30 ft. in diameter and 2½ ft. breast, supplying the motive-power. The cement-lead is 4 ft. thick, and is connected with the battery by a horse-tramway.

Milligan and party have an area of 50 acres, and employ eleven men. The cement lead, which is from 7 ft. to 14 ft. in thickness, is connected with the battery by a horse-tramway. There are ten heads of stampers, 6 cwt. each, driven by a 6 ft. Pelton water-wheel.

O. Twohill and party, who are working a sluicing claim, have for the past two years been extending the tail-race, which is now 8,000 ft. in length, lined throughout, and 5 ft. in depth ; while they have also erected a water-balance and laid down an incline-tramway. At present they are stripping off the surface, and do not expect to begin sluicing the gold-bearing materials before April. Where they are now at work the wash is 36 ft. in thickness, and judging by the prospects obtained from shafts sunk on this lead the property should be a good one, and amply repay the party for their large outlay.

Charleston.

Lucinda—This is a special claim of 52 a. 0 r. 32 p., situated at Fool's Terrace, about seven miles from Charleston, and off the road to Westport. About



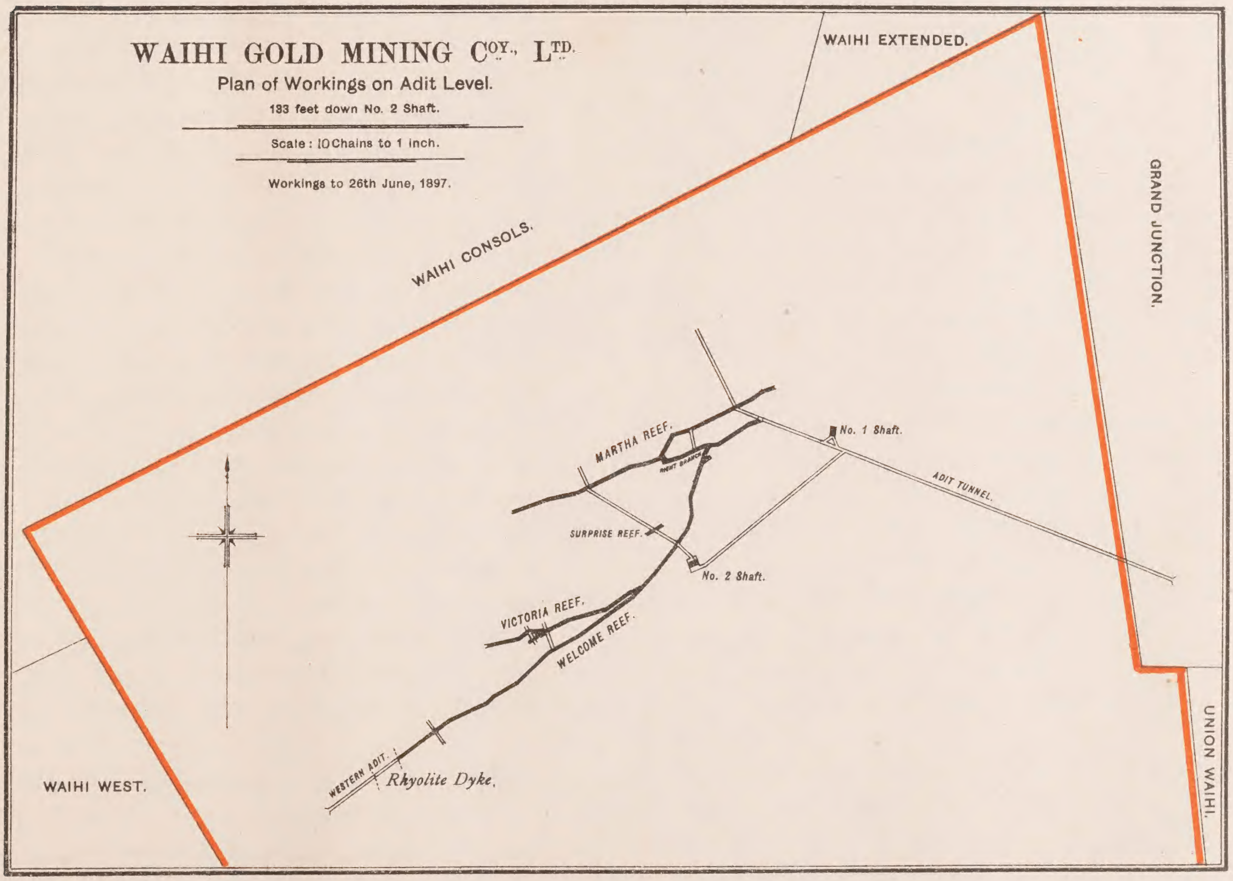
WAIHI GOLD MINING C$^{OY.}$, L$^{TD.}$

Plan of Workings on No. 1 Level.

80 feet below Adit Level.

Scale: 10 Chains to 1 inch.

Workings to 26th June, 1897.



WAIHI GOLD MINING C$^{OY.}$, L$^{TD.}$

Plan of Workings on Adit Level.

133 feet down No. 2 Shaft.

Scale: 10 Chains to 1 inch.

Workings to 26th June, 1897.

twenty prospecting shafts have been sunk to a depth of 20 ft. The "bottom" appears to dip towards the centre of the claim in the form of a basin, and as the ground is of a very wet nature the water cannot drain from it, lodging in this basin, and in consequence the shafts sunk there very soon fill up. A contract has been let to drive a tunnel 715 ft., and as soon as it is in the required distance it is expected that it will drain off the water. The deposit is chiefly a black sand lead. On the surface the prospects average 4 gr. to the load; at the bottom of the shafts it yields a very much larger average, owing probably to the gold having been "streamed" down by the soakage. The tunnel now in course of construction will be afterwards used for a tail-race. Water-races leading to this claim come from the hill, and will be about three miles in length. All the timber required for shafts, races, &c., is cut in saw-pits on the ground.

Lucy.—This is a special claim of 38 a. 1 r. 18 p., situated at Brown's Terrace, about three miles from Charleston. Twenty-eight shafts have been sunk from a depth of 20 ft. to 30 ft. The wash-dirt is chiefly a black sand lead, averaging 1 dwt. to the load. This locality was prospected some years ago and abandoned, owing to the very wet nature of the ground. There are about 500 ft. of drives, including the old abandoned tunnels, which have been cleared out and put in working order.

Rose Blanche and Grace Darling.—In connection with these special claims about eighty shafts have been sunk, with varying depths of from 12 ft. to 40 ft. The ground is flat and very wet, mostly what is locally known as "pakihi," and the shafts very soon fill up with water. The formation in the Grace Darling is principally black sand and light shingle, which prospects very well; while in the Rose Blanche it is mostly black sand and cement, there being an unbroken lead for about 95 chains. There are about five and a half miles of water-races lined and cleared through the bush ready for formation. To work these claims there will be a tail-race 37 chains in length to the Okari River, with a fall of 105 ft., and to the west of this another tail-race, 70 chains in length, is being cut, with a fall of 100 ft. Contracts have been let for sinking sixty prospecting shafts, with an aggregate depth of about 1,000 ft., at 1s. 9d. per foot. Mr. Bourke, the manager, is actively pushing on the work.

Totara.—This special claim of 26 a. 1 r. is owned by Mr. J. W. Powell. It is situated on the Nine-mile Beach, about five miles from Charleston, and is composed of sandhills. It is to be worked by hydraulic sluicing, and for this purpose a water-race 4 miles long, and to carry six Government heads of water, is being constructed, 67 chains of which will be by syphon, 15 in. in diameter, and which is being made on the ground by Mr. J. G. Harlit, a local blacksmith, who is making rapid progress with it. When the race and syphon are complete it is estimated that a pressure of 180 lb. will be available. The ground prospects very well.

Lyell.

Alpine Extended.—Since the amalgamation of the United Alpine and Lyell Creek properties, mining operations have been carried on satisfactorily. Direct communication has been completed between the two mines, and there is now good ventilation; while a tramway, 36 chains in length, has been substantially constructed, and the ore can be easily conveyed to the battery, thus facilitating the working of the mine. The output of quartz is 150 tons per week, and the average yield about 9 dwt. Forty-one men are employed, working two shifts.

Green and party (five men) are following the leaders that have been left from the former workings, and making good wages. They are working about 1,400 ft. above the level of the bottom or No. 10 level. The main drive was holed into some old ground, thus providing a good supply of fresh air.

Garbett and party (tributers) are cross-cutting for a reef that is supposed to exist on the ground where they are at work.

Crushington.

Hercules.—Since last report operations have been suspended in No. 9 east cross-cut. A contract has been let for extending No. 9 level north 100 ft. on reef track, and this work is now in progress. Since starting, 35 ft. has been driven. The country is very favourable for a reef; a nice slate track is showing in the drive, carrying well-defined walls.

Keep-it-Dark.—There is a very large reef in the stopes above No. 5 level, but up to the present time the crushings from it have proved it to be of a very low grade. Payable stone not having been found in No. 7 level, the winze between No. 6 and No. 7 levels has been opened out, disclosing a large body of stone of good quality. Apparently the reef has turned over, and is now underlying the opposite way to what it was above. The reef is strong, so there is every likelihood of its living down.

No. 2 South Keep-it-Dark.—The cross-cut westward from the old lode is now in 166 ft. The ground has been hard, but it is now somewhat easier. Some quartz leaders have been crossed, but it is not expected that any reef will be met with for some distance yet.

Murray Creek.

Inangahua Low-level Tunnel.—This tunnel and cross-cut to connect with the Golden Fleece are being pushed ahead vigorously. Machine rock-drills are cutting in both drives, the average cutting being 40 ft. per week; but a considerable amount of work has yet to be done before the connection is effected. In the main drive no change has yet been met with showing indications of a reef.

Merrijigs.

Sir Francis Drake.—At the beginning of November a parcel of 40 tons of quartz from the new find in the Gallant Section was put through the mill, and yielded 18 oz. of gold. Work has been discontinued here for the present until a deeper level is driven either from the surface or from No. 3 (shaft) level. The uprise from No. 1 level has been completed for 80 ft., and, as it is now connected with the surface, all the hands are employed here breaking-down stone. Crushing operations were resumed at the mill on 13th November. Very little work has been done in No. 2 level other than timbering ground driven.

Inkerman Combined Mines.—For the four weeks ended 27th November 511 ft. of driving has been carried out at the mine, representing new ground opened up 411 ft. and old ground reopened 100 ft.

Kumara.

Owing to the unusual quantity of rain that has fallen on the West Coast during the past four months there has been an abundance of water for sluicing operations, and the miners have been fully employed. Notwithstanding the severity of the weather no damage has been done to the Government and other dams, races, and flumes in this district. The work in No. 5 tail-race has been pushed on despite the rain, the driving now being in the solid, and it is hoped that no more of the treacherous pug, or blue clay reef, will be met with.

The purchase by the Government of Mr. Wylde's water-rights from the Wainihinihi Creek having been completed it is expected that the construction of the race will soon be put in hand, and, when finished, it is calculated by the water-race manager that in the driest season there will be an ample supply of water for sluicing purposes at Goldsborough, Stafford, and Callaghan's.

The Deep Level Company, Kumara, in driving from the bottom of their shaft, came on to some payable wash, but it has not yet been sufficiently proved to determine its value.

The small lead at Dillman's, from which a good deal was expected, has not so far turned out much gold, but hopes are still entertained that something better will be discovered in the locality. There are five parties at work there, and they are said to be making fair wages.

* * *

OTAGO GOLDFIELDS.

Pembroke.

James Jones and party are on fairly good gold at Cardrona, making from £3 to £5 a week per man.

The Matatapu Hydraulic Company, who were getting some nice samples, had to knock off work owing to floods in the Matatapu River.

Arrowtown.

The Arrow Flat, at the back of the town, has again been taken up by Mr. W. Taylor, of Invercargill, on behalf of a syndicate. This may be due to the fact that the Arrow Falls Tunnelling Company, in which a large interest is held by Invercargill shareholders, are reported to have had some very good returns.

Cromwell.

Most of the dredges working on the Clutha and Kawarau Rivers had to suspend operations owing to the floods. On the Nevis River the Nevis Company's dredge has been at work for most of the time, the Ngapara No. 2 has bottomed at 30 ft., and on Allen and Aitken's claim at Nevis mouth the pontoons are approaching completion. At Riley's beach the frames of the pontoons are up, and work is being vigorously prosecuted, but the Bowman's Flat Company have been unable to get to work owing to the non-delivery of machinery.

The party who have taken up the Alta quartz claim, which was worked a quarter of a century ago, and on which a lot of money was misspent, are very sanguine of success. Some stone brought in to Cromwell, and pounded in a mortar, yielded at the rate of over 3 oz. to the ton, and a second parcel over 10 oz. to the ton. The samples were got from a depth of 15 ft., and the claim is within about three miles of the Cromwell Company's mine at Bendigo. The main lode, which varies from 2 ft. to 5 ft. in width, has been traced for a considerable distance along the hillside.

Naseby.

During the past month mining operations have been carried on steadily, the water-supply having been about equal to the demand. Dredging still continues to occupy attention. Ten applications

were received for special claims and licensed holdings, the majority being for dredging purposes. The pontoons for one dredge (Messrs. Guffie and party being the owners) have been built and launched.

The past month has been marked by the prevalence of high, dry winds, with but little rain until the last week, when the weather became cold, the mountain tops being covered with snow.

* * *

COAL-MINES.

The following is the output of coal from the West Coast coal companies' mines during the quarter ending 30th September, and the amounts paid (at the rate of ½d. per ton) to the credit of the Miners' Accident Relief Fund at the post-office :—

Company.		Tons.	cwt.	£	s.	d.
Denniston	...	45,494	14	94	15	7
Millerton ...	..	18,006	15	37	10	3
Cardiff ...	...	12,744	0	26	11	0
Brunner ...	...	23,001	17	47	18	5
Blackball ...	...	11,008	0	22	18	8
Totals	...	110,255	6	£229	13	11

The output of the Westport Coal Company for the month of November was 17,854 tons, and Westport-Cardiff Coal Company 3,394 tons, making a total of 21,248 tons. Of the Westport Coal Company's output, 1,628 tons were shipped to foreign ports—805 tons for Newport, near San Francisco, by the barquentine "Gleaner," and 823 tons for Honolulu, by the four-masted barquentine "Arago." The number of sleepers sent away was 4,359.

During the month of November sixty-six steamers and two sailers, representing 20,792 tons register, entered the Port of Westport, and sixty-three steamers and four sailers, representing 20,707 tons register, left the port, the total tonnage being 41,499 tons. The average depth of water on the bar for November was 24 ft. 6 in., and 18 ft. 6 in. in the river.

The export from the Port of Greymouth for the month of November was 8,408 tons of coal, 2,679 sleepers, and 601,930 ft. of timber.

* * *

According to *l'Echo des Mines*, of Paris, small veins carrying platinum have recently been found in syenitic rocks in Hungary. Platinum has also been found in veins of manganese-ore existing in altered or decomposed syenites near Santa Rosa de Osos, in Colombia.

EXPLOSIONS IN COAL-MINES.

[By Mr. John Hayes, F.S.Sc., M.E., Acting Inspector of Mines, Dunedin.]

IN approaching this subject it must be borne in mind that coal itself is the product of the decomposition of vegetable matter, and is composed of those elements which enter largely into the composition of vegetable organisms—*e.g.*, carbon, hydrogen, and oxygen.

In all coal-mines gases of one kind or another are invariably exuded either from the coal itself or from the adjacent strata, those most commonly met with being carbonic acid (or carbon-dioxide, CO_2), known to miners as "stythe" or "black-damp," and carburetted hydrogen (or marsh gas, CH_4) familiarly termed "firedamp." The former (CO_2) is practically 50 per cent. heavier than the atmosphere, and is therefore first met with near the floor of the mine-workings.

It is highly poisonous; an atmosphere containing 10 per cent. of this gas will neither support human life nor combustion. Carburetted hydrogen is only about half the weight of the atmosphere (CH_4, 0·557; specific gravity of air, 1·000), and is composed of 2 volumes hydrogen, 24·6 by weight, and 1 volume carbon, 75·4 by weight. Being so light, it naturally rises to the highest available place, and is found near the roof of the workings. In its pure state it is poisonous, and will not support combustion until mixed with about five times its own volume of air. The writer has frequently met with it in large volumes, when, prior to its becoming diffused with, and ultimately being carried away by, the air, lights have been extinguished as suddenly as if plunged into water, and men made unconscious just as quickly. By adding over five times the amount of air to one of gas the mixture becomes explosive, its greatest explosive proportions being reached when containing 9·4 volumes of air to 1 volume of gas. When more air is added, and the proportions are as 13 to 1, the explosive force becomes feeble. The presence of gas may, however, be detected when diluted with 30 volumes of air, or, practically, when the atmosphere contains 3 per cent. Within the last few years lamps specially constructed for testing purposes have been introduced which will detect practically ½ per cent. of carburetted hydrogen in the air. Hydrogen gas in other forms is also sometimes met with in mines under certain conditions, but it is carburetted hydrogen mixed with air in suitable proportions which is the explosive agent in what is known as a "fire-damp explosion."

This gas is not met with in all coal-mines. Many collieries have been worked for generations without a trace being discovered; in others its exudation is fairly steady while opening out new ground, and it is gradually drained off, but in many instances its liability to be present is continuous, necessitating the utmost care and vigilance in the management and ventilation of the mine. Very great danger is to be apprehended in mines where there are unworked seams above or below, from which large bodies of CH_4 may be given off. This danger often exists, and the pent-up gases in unworked seams find relief, through fissures, falls of roof, upheavals of floor, and the subsidiary action of the strata concurrent with the excavation of the seam being operated upon, into its roadways and working-places. Within the writer's own experience gas from a lower seam than that being worked used to cause serious upheavals of floor, and to relieve this bore-holes were put down at intervals, at some of which a pressure of 35 lb. per square inch was frequently registered. In some other instances holes had to be similarly bored upwards to relieve the pressure of gas on the roofs. Still another source of danger is where deserted workings containing a large accumulation of gas have to be tapped. The writer has had frequently to undertake and carry out operations of this kind without any stoppage of the ordinary work of the colliery. Much thought, preparation, and care had to be exercised; the work gave rise to great anxiety, but in every instance was safely and successfully accomplished.

A period of atmospheric depression is more conducive to the exudation of gas than one registering a high barometrical pressure; and any mine gas being so light in comparison with mercury, its presence may often be felt long before a diminution of atmospheric pressure is indicated by the barometer. This feature is specially noticeable in approaching deserted workings, and in such places every care should be paid in maintaining brisk ventilation.

Assuming that in some part of a coal-mine a quantity of CH_4 has accumulated, that it is mixed with air in explosive proportions, and is in any way ignited, an explosion more or less violent will ensue. How far this explosion will extend depends upon existing local conditions. For instance, there may be a large body of gas extending some distance back from the point of ignition, but under such conditions that only a limited amount of it can be mixed with air. The greater body of gas will not, under these circumstances, explode, the explosion being confined to the mixture of gas with a suitable proportion of air. This actually occurred at a Lancashire colliery some years ago, the writer being in another portion of the mine at the time. The circumstances were as follows: A pair of headings had been driven for several hundred yards in length some years previously. Owing to subsequent trade depression they fell into disuse, and consequently out of repair. As the seam was naturally "fiery,"* they gradually filled with CH_4. These headings were wet. In course of time, a repairing gang was sent to put them into working-order. Ventilation was restored as the work proceeded, sufficient fresh air being carried forward to meet existing requirements, and on the day in question, when the repairs had been about half completed, one of the men by some means or other ignited the gas. An explosion occurred by which a couple of men were severely burned, but the effects of the explosion were quite local, and no violent shock was experienced at any great distance from the point of ignition. The mine was damp throughout, and this, no doubt, accounts for the localisation of the explosion in a forward direction. The purity of the gas—*i.e.*, the want of air beyond the point to which repairs had been completed—prevented the explosion travelling backwards from the point of ignition towards the face of the headings.

The most extensive explosion of CH_4 and air pure and simple of which the writer knows occurred at Whitehaven Colliery, Cumberland, in April, 1882. At this colliery the workings extend some three miles under the sea, the shafts being close to the shore. A "fault," or dislocation of strata, had been met with, by which the seam was thrown down for a distance of nearly 100 ft. To recover the coal a tunnel dipping 1 in 6 was driven until the seam was again reached, when CH_4 was given off to such an extent that further operations in this direction had to be suspended for some months until the pressure of gas had considerably expended itself. When work was resumed the first duty of establishing a proper system of ventilation into this new coal was undertaken and accomplished, and preparations were then made for driving the headings. As is usual in that particular seam throughout the entire Cumberland Coalfield, it gave off a fair amount of water on being first tapped, consequently everything beyond the "fault" referred to was wet. A heavy fall of roof took place and blocked the return airway. In consequence of this the temporary arrangements which had been in use for ventilating the tunnel, &c., before the main air-course had been constructed had to be again resorted to for the time being, and carried a current of 10,800 cubic feet of air per minute. The coal was still "lively," gas being freely given off. In all probability there may have been a few puffs of gas from the strata with rather more than ordinary pressure, sufficient, at all events, to convert it, in combination with the air present, into an explosive mixture. Some of the men became alarmed and rushed out, concurrent with which the explosion took place. Subsequent examination of their safety-lamps led to the belief that flame had passed the gauze of one of them and thus ignited the mixture. It was estimated that over 30,000 cubic feet of explosive mixture of air and gas exploded.

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* The familiar term applied to mines giving off quantities of fire-damp (CH_4).

The bodies of the men who ran were found at the top of the tunnel, up which (judging from the positions in which their lamps were found) they were probably blown by the explosion; but a man working in the very extreme end—at the face of a dip-stenton from the back heading—who did not run away in alarm, not only survived, but succeeded in reaching the top of the tunnel. Two men at work near the top of the tunnel escaped, the force knocking one of them down and extinguishing the lights. These men were not burnt and saw no flame.

The two examples given serve to show clearly that any explosion of a mixture of firedamp and air only is quite local, its extent being practically confined to the area containing the explosive mixture *plus* that due to expansion of flame; and to account for the serious and extensive disasters which have occurred from time to time in well-ventilated collieries, where an accumulation of gas in sufficient quantity to be entirely responsible for the havoc created has been a practical impossibility, it is quite evident that some other agent must exist by which an explosion may be propagated and continued. That agent is coal-dust.

Coal-mining cannot be carried on without some of the mineral being broken very fine and crushed into dust in many ways, but it is on the main haulage roads (which, as a rule, are the "intakes" or fresh-air roads also) that the greatest amount of dust is usually found. It shakes from the trucks used for conveying the coal; trucks sometimes get upset, or lumps of coal fall off in transit and get crushed by the traffic, the finer particles being carried in the air-current and some of it deposited on the rough surfaces of the roadway, the timbers supporting the roof and sides, or any other place where a lodgment is afforded, while the floor may be covered with a layer of dust several inches in depth. Any sudden disturbance of the ventilating current will raise the dust in clouds, and the ordinary traffic of a busy roadway keeps it in a more or less agitated state, with suspension in the air to some extent.

So far back as 1803 Mr. J. Buddle, an eminent North of England "colliery-viewer" of the time, stated, in reference to an explosion at Wallsend Colliery, Newcastle-on-Tyne, "The workings were very dry and dusty, and the survivors, who were the most distant from the point of the explosion, were burnt by the shower of the red-hot sparks of the ignited dust, which were driven along by the force of the explosion."

This appears to be the earliest record of the effects of dust in a colliery explosion, and in those days, when the ventilating currents were far short of what is the rule now, the ignition of dust and its evolved gases would certainly be on a smaller scale, purely from want of air in sufficiently large volumes to promote combustion to any great extent. The next record is in a report by Professors Faraday and Lyell on the explosion at Haswell Colliery, Durham, in 1844. These scientists were really the first to demonstrate the important part which coal-dust may play in aggravating and extending injurious effects of firedamp explosions.

After discussing the subject of firedamp in mines, and the origin of this particular explosion, they say, "In considering the extent of the fire from the moment of the explosion it is not to be supposed that firedamp was its only fuel, the coal-dust swept by the rush of the wind and flame from the floor, roof, and walls of the works would instantly take fire and burn if there were oxygen enough present in the air to support its combustion; and we found the dust adhering to the faces of the pillars, props, and walls in the direction of and on the side towards the explosion, increasing gradually to a certain distance as we neared the place of ignition. This deposit was in some parts half an inch, in others almost an inch thick; it adhered together in a friable coked state. When examined with the glass it presented the fused round form of burnt coal-dust, and when examined chemically and compared with the coal itself, reduced to powder, was found deprived of the greater portion of the bitumen, and in some instances entirely destitute of it. There is every reason to believe that much coal-gas was made from this dust in the very air itself of the mine by the flame of the firedamp which raised and swept it along, and much of the carbon of this dust remained unburnt only from want of air."

Faraday subsequently stated, as the substance of his conclusions on the part taken by coal-dust in the Haswell disaster, that "the ignition and explosion of the (firedamp) mixture would raise and then kindle the coal-dust which is always pervading the passages, and those effects must in a moment have made the part of the mine which was the scene of the calamity glow like a furnace."

Ten years after the report of Faraday and Lyell the Chief Mining Engineer to the French Government advanced similar views as the result of an explosion at Firminy; and again in 1861, after two other explosions, the same official reiterated his opinions. Other French engineers followed up the subject some years later, and agreed that a small explosion of firedamp and air might, in a dry and dusty pit, originate an explosion out of all proportion to that due to a mixture of CH_4 and air alone.

About this time Mr. Wm. Galloway, then one of Her Majesty's Inspectors of Mines for the South Wales district, commenced a series of experiments on a larger scale than those of the French engineers. His earlier investigations went to show that an air-current charged with firedamp to the extent of 2 or 2½ per cent., and not in itself explosive, could be rendered so by suspending coal-dust in it; and also that flame produced by an explosion of firedamp mixture in one part of the mine might be propagated by coal-dust raised by such explosion and thickly suspended in the air travelling through the mine, even in the complete absence of firedamp in the air. As the result of further experiments and investigations into the causes of three colliery explosions in 1880, Mr. Galloway arrived at the conclusion that "firedamp is altogether unnecessary for the propagation of flame with explosive effects by a mixture of coal-dust and air."

Professor Marreco, in conjunction with Messrs. W. Cochrane and D. P. Morrison, also devoted considerable attention to this subject in the North of England, contemporaneously with Mr. Galloway. They found that by firing a pistol-shot into a current of air carrying fine coal-dust in suspension a violent explosion ensued. The Professor's researches also led him to confirm the observations originally made by Faraday and Lyell—namely, that the coal-dust is in part submitted to destructive distillation during the progress of the flame through the dust-laden-air.

About 1875 Mr. H. Hall, H.M. Inspector of Mines for the Liverpool district, in conjunction with Mr. G. Clark, made a series of experiments. Both gentlemen are personally known to the writer, and the experiments took place at a colliery adjoining that at which he was then engaged.

Charges of powder were fired from a cannon (to produce similar effects to those from a blown-out shot) at the face of a new and well-ventilated incline some 45 yards long, which was then being driven in coal from the outcrop of a seam having a dip of fully 1 in 4. The conditions were most unfavourable in respect to obtaining a coal-dust explosion, as the incline was very wet indeed, and the temperature only 50° Fahr.

The charges of powder varied from 1½ lb. to 2½lb., and at first were stemmed with broken stone. Flame was projected 15 ft. Afterwards coal-dust was used for stemming, and a layer of coal-dust spread on the wet floor of the incline for about 25 ft. from the cannon. Flame was found to extend 30 ft. with a charge of 1½ lb., to 45 ft. with a 2 lb. charge, and to 60 ft. with a 2½ lb. charge. As the floor was so very wet, boards were laid the full length of the incline, and a layer of coal-dust scattered over them. Upon firing a 2½ lb. shot the flame extended the whole distance and issued in large volume from the mouth of the incline tunnel. Messrs. Hall and Clark were of opinion that the fierceness of this latter blast would have been fatal to any one exposed to it, and, as the result of their experiments, considered themselves justified in assuming that "in dry mines, at a high temperature, and where the roads are thickly covered with fine dust, the dust will play a considerable part in extending and adding to the destructiveness of an explosion."

(To be continued.)

THE SOLUTION OF GOLD IN ACCUMULATED AND OTHER SLIMES.

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[Paper read by Mr. W. A. Caldecott before the Chemical and Metallurgical Society of South Africa.]

THE problems presented in the treatment of accumulated slimes are in a great measure of the same nature as those which occur in dealing with slimes direct from the mill. In one important respect, however, there is usually a considerable variation, and this is as regards the primary operation of dissolving the gold. As is well known, the gold in slimes fresh from the battery is generally very readily soluble in cyanide solution. When slimes are settled in dams or pits, however, certain reactions take place which result in the formation of decomposition products corresponding with conditions obtaining. Among the products of importance, so far as subsequent cyanide treatment is concerned, is ferrous sulphide (FeS), derived from the decomposition of pyrites (FeS_2). This compound imparts a dark-grey or black colour to those layers in the slimes dams in which it occurs in any quantity, and may be readily identified therein by the odour of sulphuretted hydrogen on adding acid, by the darkening of moistened lead-acetate paper exposed to these fumes, and by the purple reaction in an alkaline solution with potassium nitro-prusside. The exact stages by which it is derived from the pyrites may be open to discussion. My own view as to its formation may be expressed by setting forth as follows the main stages of gradually-increasing oxidation through which iron-pyrites, either as pyrite or marcasite, passes before it finally attains its final stage of highest oxidation under natural conditions :—

(1.) FeS, iron-pyrites.
(2.) FeS + S, ferrous sulphide and sulphur.
(3.) $FeSO_4 + H_2SO_4$, ferrous sulphate and sulphuric acid.
(4.) $Fe_2(SO_4)_3$, ferric sulphate.
(5.) $2Fe_2O_3$, SO_3, insoluble basic ferric sulphate.
(6.) Fe_2O_3, ferric oxide.

As may be seen by detailed references to authorities mentioned in a communication by myself to the proceedings of the London Chemical Society of the 29th April, 1897, it has long been known that ferrous sulphide is produced by the reduction of iron sulphates in nature by decomposing organic matter, but I am not aware that its derivation from pyritic ore or its presence in slimes dams has hitherto been publicly recognised. The formation of ferrous sulphide proceeds very rapidly after the deposition of slimes in the dams, where they settle, forming a compact mass practically impervious to air and water. After a few days the more pyritic layers of slimes contain as much as 0.25 per cent. FeS, soluble ferrous salts and free acid being almost nil. Certain gold-ores naturally contain a large amount of ferrous sulphide in the form of magnetic iron-pyrites (6FeS, FeS_2), copper-pyrites, (CuS, FeS), or arsenical pyrites ($FeAs_2S_2$).

When dry iron-pyrites are heated in absence of air or are finely pulverised in an iron mortar ferrous sulphide is readily produced. The same reaction takes place to a slight extent during the operation of crushing in a mill, particularly when the water for the plates has been heated beforehand to assist amalgamation, and in some cases there may be sufficient FeS thus found to affect the treatment.

During the treatment of slimes by cyanide the presence of finely-divided ferrous sulphide causes abstraction of oxygen from the solutions, whereby the solution of the gold is prevented. Other ferrous compounds, such as ferrous hydrate (FeO_2H_2), react in the same way as does the decomposing organic matter always present in a more or less degree in slimes dams. The obvious remedy for these difficulties is to supply oxygen artificially, either in the form of air delivered from a perforated pipe fixed near the bottom of the agitation-vat containing lime pulp or in the form of an oxidizing agent. The cheapest and most suitable of the latter has been found to be potassic permanganate. The present slime plants of the Rand Central Ore-reduction Company have employed aëration of all pulp in their dissolving-vats as part of the regular treatment since the latter part of last year, accelerated when this operation took too long, or when much organic matter was present with $\frac{1}{8}$lb. to $\frac{1}{2}$lb. $KMnO_4$ per ton of dry slimes. All plants now under construction for the treatment of accumulated slimes will be equipped with large air-compressors delivering up to 1,800 cubic feet of air per minute. The advantage of deep vats where aëration is employed so as to get as much efficiency as possible out of the air is obvious, as is also the necessity for delivering the air in small bubbles so as to bring the maximum amount of surface into contact with the slime pulp. Again, it has been found by experiment, as might have been anticipated, that for a charge containing a certain amount of ferrous compounds and other reducing substances a corresponding volume of air was required, whether applied in one hour or distributed over ten hours. Hence the advisability of aërating as quickly as possible in order to lessen the time and power required for keeping the slimes in suspension by agitation.

Speaking generally, old accumulated slimes are considerably more acid than accumulated tailings, and although in the stirring process all possible efficiency is got out of the lime employed to neutralize this acidity, yet consumptions of from 8 lb. to 20 lb of lime per ton of dry slimes are by no means uncommon. The ferrous sulphate in the slimes and on ferrous sulphate formed by oxidation of ferrous sulphide through aëration has a tendency to abstract nitrogen from the solutions, and also to consume cyanide by converting it into ferro-cyanide. By a further aëration this ferrous hydrate is converted into innocuous and inert ferric hydrate. Hence in the treatment of accumulated slimes preliminary aëration or its more costly equivalent in the form of an oxidizing agent has lowered the cyanide consumption by about 50 per cent., a saving which more than pays the cost of aëration ; even with the acid slimes above mentioned the actual cyanide consumption is now only $\frac{1}{2}$ lb per ton of dry slimes, or less than the cost of the lime employed. Of this $\frac{1}{2}$ lb. only about one-half is consumed by the slimes themselves, the remainder being discharged as dilute solution with the residues, or lost by exposure to the air and by decomposition in the precipitating-boxes.

The use of air for accelerating the solution of the gold in auriferous material has long been talked of and experimented upon, and forms the subject-matter of various patent specifications. In the treatment of most accumulated slimes, however, the gold simply does not dissolve without its application, so that, instead of merely accelerating the reaction, it becomes as necessary for their treatment as cyanide itself. It is probable that before long aëration, now regularly used for the first time on a working scale, will also serve as a means of agitation in place of mechanically-driven paddles at present employed, but this application of its use, as well as various other adaptations now under investigation, is still in the experimental stage.

At the present time the method of dealing with accumulated slimes differs only in the earlier stages from the treatment of fresh battery slimes, the subsequent operations of settling, decantation, precipitation, &c., being much the same. These earlier operations, which vary in detail according to the particular slimes under treatment, are generally as follows: The truck-loads of slimes are dumped into a small constant-discharge pulping-vat containing fast-running paddles. A pipe delivers a continual stream of weak solution at the bottom of the vat near one side, and at the top on the other side is an overflow launder, through which the slime-pulp continually discharges, as the lumps become disintegrated, into the dissolving-vat. Here it is aërated whilst being stirred by air delivered from an air-compressor through a perforated pipe fixed near the bottom of the vat until sulphides are no longer apparent in the pulp on applying the acid and lead-acetate paper test. This aëration may take from two to twenty hours, and varies with every charge. After the sulphides are oxidized an hour or two longer aëration is given to oxidize any ferrous hydrate remaining, and the cyanide is then added. This brings the solution up to 0·005 per cent. KCy to 0·008 per cent. KCy, which, though containing only a couple of ounces of potassic cyanide to a ton, is found amply strong enough to dissolve the gold. During the charging and subsequent aëration lime is also added to bring the alkali strength of the solution up to 0·006 per cent. to 0·010 per cent., as any higher percentage of lime is found to be unnecessary for expediting the subsequent settlement of the slimes. The agitation and aëration are continued for a period of from two to five hours after the addition of cyanide, as experience shows, and the slime-pulp containing all the gold in a state of solution is then transferred to another vat and diluted preliminary to settling. Any permanganate to be added is put in as soon as the dissolving-vat is full, as it is found that but little of the ferrous iron present is oxidized whilst much organic matter is present.

Such, in brief, are the operations involved in dissolving the gold in slimes containing reducing substances, and it may be stated that the acquisition of the experience requisite for successfully dealing with such material has been very costly, both in money and in labour. The solution of the gold in the treatment of slimes can now be insured, but much still remains to be done in the investigation of the various constituents of slimes and their interaction with one another and with the agents—lime, air, and cyanide—used in slimes treatment. In the running of a slimes plant it is obvious that considerably more skill and attention are required both of manager and shift-men than with a sand plant of equal capacity. Besides constant attention to the machinery and appliances for stirring, transferring, and decanting, continual tests for and records of sulphides, alkali, and cyanide are necessary, and the whole treatment of a charge must be completed in a fraction of the time required for sands.

In conclusion, one or two details of laboratory practice in connection with slime-work may be given. The percentage of dry slimes, or the ratio of slimes to solution, in any pulp may be determined with fair accuracy from its specific gravity x by applying the following formulæ :—

$$\text{Percentage of dry slimes in pulp} = \frac{158.8(x—1)}{x}.$$

$$\text{Slimes : Solution} = (x—1) : (1—0{\cdot}37x).$$

All tests to determine gold-extraction from pyritic slimes should be made on the moist material, as the process of drying effectually changes the conditions of actual working by oxidizing the reducing substances present.

Alkali determinations, as already remarked, constantly require to be made by shift-men in a slimes plant. This is done as follows (according to the method suggested by Mr. J. E. Clennel): Take 100 c.c. of solution to be tested; determine cyanide strength with standard silver nitrate solution (1 c.c. AgNO solution = 0·01 per cent. KCy); add a drop or two more of $AgNO_3$ solution to the test, and a few drops of 0·5-per-cent. solution of phenolphtalien as indicator, and titrate with decinormal acid (1 c.c. $\frac{N}{10}$ acid = 0·004 per cent. akali). The best acid to use, being stable, is $\frac{N}{18}$ H_2SO_4, prepared in the usual way; but in case the appliances for preparing this are not available a decinormal oxalic-acid solution may be used, as recommended by F. Mohr. A decinormal solution of this sufficiently accurate for practical purposes may be prepared, like the standard silver nitrate solution, by dissolving 6·3 grms. pure dry oxalic acid in distilled water, and making up to a litre.

Mr. Crosse: I know the discussion on this paper will be postponed. There is only one important question I would like to ask Mr. Caldecott, because he might be misunderstood. He said the amount of slimes in any solution could be determined by taking the specific gravity.

Mr. Caldecott: With fair accuracy.

Mr. Crosse: I do not see how that can be managed. How do you take the specific gravity?

Mr. Caldecott: I took the specific gravity in the ordinary way, by weighing equal volumes of water and slime-pulp. The hydrometer readings are not sufficiently accurate, owing to the rapid settling of the slimes.

Charles Butters: There is a good deal more in Mr. Caldecott's paper than appears on the surface. When you have a contract to treat some hundred thousand tons of slimes, and you cannot dissolve the gold owing to the want of knowledge, it is a very great relief to find out. At the time these experiments were carried out we were in very great difficulties at the Robinson on account of the gold not dissolving, and Mr. Caldecott deserves a very great deal of thanks from us. There are millions of tons of accumulated slimes on these fields. I was obliged to close down the Crown Reef slimes plant because we could not make it pay, and I think we would be obliged to close down a good many others if this matter had not been worked out.

RIVER-DREDGING FOR GOLD.

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[Written for the *Mining and Scientific Press*, San Francisco, by Mr. R. H. POSTLETHWAITE.]

REGARDING river-dredging for gold, I find from my own observation, and also from the letter written by Mr. Richards in the issue of the *Mining and Scientific Press* of the 12th June, that so far subaqueous mining has not been a success in this State. I have read Mr. Richards's letter with great interest, and fully indorse his remark that successful dredging must be the result of mechanical skill and "evolution." This evolution is exactly what I claim for the class of dredges that I am now designing, and which are being built by the Risdon Iron-works.

A brief *résumé* of dredging as carried out on the River Molyneux in New Zealand, where there are now working some sixty dredges, will show the evolution process. It is a very swift river, carries more water than the Sacramento, and the bottom is composed of a layer of barren tailings varying from 1 ft. to 20 ft. deep and travelling at varying velocities; then comes the old formation of boulders and gravel interspersed with seams of pay dirt. As there is an immense amount of gold in the bed of the river, it was at once recognised that means must be found to handle it. In the early days the miners worked the banks as far in the river as they could reach with spoon dredges. The next evolution was a small, weak, and poorly-constructed bucket-ladder dredge driven by current wheels on either side. These proved very inadequate to handle the heavy boulders, and were only able to work in the current. The next step was to make the machinery heavier and put on a steam-engine. It was about this time that the use of the spud—in New Zealand called a sett—came in, but did not last very long, as it was found inefficient and took more hands to work it. The spud is not found now on any dredge in the country, being quite out of date. In place of the spud the best dredges use a power-winch with six drums, all being under the control of one man. Four of these drums carry lines running from the four corners of the dredge, the other end of the line being affixed to "dead-men" or backers on the beach. The fifth drum carries the head-line. With these five lines the dredge can be made to rapidly take up any position necessary, one man handling her with the greatest ease and nicety and with no loss of time. The sixth winch-barrel carries the ladder-line, raising or lowering the ladder as necessary. For lifting the large quantities of gravel, rock, and boulders, after long and thorough trials, it has been found that the bucket-ladder will easily beat the centrifugal pump. The pump-dredge was given a very fair test, different makes of pumps being used, but all attempts ended in failure. The failure arose from two causes—first, lack of efficiency. Mr. Richards, who is a leading authority on centrifugal pumps, will bear me out that directly you design a pump to carry large stones you do so at the loss of efficiency. In the second place, unless boulders up to one ton in weight could be handled a machine was useless in the Molyneux. For sand or slurry the centrifugal pump, I at once admit, is the thing, but not for gold-dredging. Two other methods have been tried—one the pneumatic caisson. This would be all right for a rich patch, the locality of which was exactly known, but for regular everyday work, where much barren stuff had to be lifted, it proved a lamentable failure. The last method was the hydraulic elevator—a most excellent appliance in its place, but this place is not in a river-bed 40 ft. below the level of the water, as most of the work of the elevator then consists in pumping water which does not carry gold. The successful gold-dredge of the present day is the evolution of thirty odd years, each dredge built being an improvement on the predecessor. No man can sit down and design a dredge by calculations, the strains the machine is subject to being so variable and impossible to accurately foretell. The main shafts of the present dredges are made at least twice as heavy as would be arrived at if calculated to transmit the average horse-power used. These sizes have been arrived at by gradually enlarging until a size has been found which will resist the heavy shocks the dredge is subject to. I am now building a dredge on the Yuba River to dredge 45 ft. deep with a gross capacity of ninety-three cubic yards an hour. The dredge consists of two long pontoons, each 96 ft. long and 9 ft. beam. These are connected at the stern by a small pontoon 17 ft. long and 5 ft. wide, the bow being connected by a heavy overhung beam. This practically makes one boat 96 ft. long, 23 ft. wide, with a well-hole 5 ft. wide running through the centre for some 75 ft.

The ladder, 67 ft. long, built up as a heavy lattice girder, is hung at the stern end by a bar fixed across a heavy wooden framing. The lower end of the ladder carries a five-sided tumbler, and is suspended by blocks and tackle to a cross-beam. By means of wire rope and blocks the winch can raise or lower the bottom end as required. The top tumbler is carried by the timber framing some 3 ft. above the top end of the ladder. The continuous bucket-chain comes up the top side of the ladder on rollers round the top tumbler and back in a catenary curve to the lower tumbler. The top tumbler is driven through a rope transmission and heavy gears by the engine, a vertical compound condensing one, which also drives the pump, and indicates about 35-horse power.

The material discharges from the buckets on to a delivery-plate, down which it shoots into a revolving screen or grizzly. The centrifugal pump, throwing 3,000 gallons per minute, supplies water to a perforated pipe inside the screen. This water thoroughly washes the material, the finer washdirt and gold going through holes in the screen and falling into a distributing-box. From the distributing-box it passes on to a set of gold-saving tables, 11 ft. wide, and thence into a flume. In this connection I would like to point out that the experience in New Zealand leads us to get the greatest width of table practicable, thus running the washdirt over it in a thin or shallow stream, whereas the general practice here seems to be to use a narrow, long flume. A wide table with frequent drops and changes of velocity of the stream, together with fairly frequent washing up, is, I feel satisfied, the secret of saving fine gold when mixed with much black sand. The tables are covered with cocoa-matting and expanded metal, a finer gold-saver than which was never used. The stones and rocks pass through the screen down a stone shoot, either direct into the river or on to a tailings-elevator when working into a high face of gravel.

It is now in place to consider the class of ground that can be worked with a dredge and the cost per yard of handling the same. Broadly speaking, any ground which is not deeper than 60 ft. below water-level or more than 20 ft. above, and which contains boulders of not more than, say, one ton weight, can be handled at from 3 to 5 cents per cubic yard. The ground need not be in a river, provided the steepage is sufficient to float the dredge and keep the water clean enough to wash the dirt with. I think I can say with confidence there is no other method by which ground, provided it fills the above conditions, can be handled so cheaply.

I have felt a little diffident as to writing the above, as I fear some of your readers may say, "What right has a man from a little country like New Zealand to come here and tell us that their knowledge is much greater than ours?" In very many ways California is well in advance of New Zealand, especially in quartz-milling, and I have learnt much since I came here; but in this one particular class of mining—viz., dredging for gold—I do claim, and with justice, that New Zealand has had more experience than all the rest of the world, and if any of your numerous readers will do me the honour of coming to see the dredge on the Yuba when working they will be ready to admit that it does all I claim for it. There is, I believe, in California an immense area of country which can be profitably worked by the above method, and anything which keeps the miner in California is a general and direct benefit to the State.

Mining schools have been founded at Tiflis and Tomsk by the Russian Government to meet the want felt for qualified mining engineers.

THE WAITEKAURI GOLD-MINING COMPANY (LIMITED.)

THE ordinary general meeting of the shareholders in the Waitekauri Gold-mining Company (Limited) was held at the Cannon Street Hotel, London, E.C., on the 26th October, Mr. Thomas Russell, Chairman of the Company, presiding.

The Chairman's Address.

During my recent visit to New Zealand I had the great advantage of inspecting the company's property at Waitekauri. I have known the Waihi mine well for many years, and my knowledge of that mine has been of great use to me as a director of the Waihi Company, but I had not seen the Waitekauri mine before my visit in March last, and was glad of the opportunity of making myself acquainted with the position of the property and its surroundings. If I had known the position before, as I got to know it when there, it would have been of advantage to the company. On my return to England I wrote to my colleagues stating my view of the principal facts which came to my knowledge. This letter was printed and sent to the shareholders. That letter and the expert's report, which accompanied it, gave you a good deal of valuable information. The more recent reports in your hands have brought this information up to a still later date, and there is not much new to add to what you already know; but before I ask you to adopt the report and accounts, I wish to make a few observations upon the present mining position at Waitekauri. In the letter I have referred to, I told you that "a good deal remained to be done before the mine, reduction works, and plant would be up to the full requirements of the property." When I was there in March last the heavy pumping plant required for the No. 2 shaft could not be procured. The local foundries were full of work, and they refused to take fresh contracts except for delivery at distant dates to suit their own convenience, but which would not have suited our requirements. This was the cause of considerable uneasiness to us, for the No. 2 shaft is of great importance in connection with our plan of operations. It has been made to enable us to work upon the Premier and Battery runs of gold in the No. 2 level, which we are now about to open, and the other levels to be opened lower down. Some time back we had serious delay at the No. 1 shaft in consequence of the failure of English contractors to deliver plant and machinery up to contract-time, and it looked to me as if we might have to submit to the same experience and come to England again to get the pumping-plant required for the No. 2 shaft, but by tact and good management this difficulty has been overcome. We have procured the pumps in the colony; both of the shafts have been sunk to the necessary depth, and a crosscut from each shaft has been commenced, and is now being driven to cut the reef in the No. 2 level. This has been a good piece of work, and reflects credit on the energy and ability of Mr. Davey, the superintendent now in charge of our mine. On the occasion of my visit it was quite apparent a good deal still had to be done to the mill- and reduction- plant to fit it for permanent and steady work. More vats were required, and there was difficulty in getting the material for them. It could not be got in the colony, and had to be imported. The material was imported, the vats made, and the vat-space has been largely increased, and it is now ample for the present capacity of the mill; more kilns had to be built, and a good deal of other work was required about the reduction-plant, and all this has been done. The forty-stamp mill is now quite finished, and is in all its appointments a first-class mill. There is no dry-crushing mill in the colony, and, as far as I know, no wet-crushing mill either, which can dispose of the same quantity of ore in proportion to its size. The best results obtained at Waihi are a ton and a quarter per stamp per day, but the Waitekauri mill with heavier stamps crushes a ton and a half per stamp per day. The small ten-stamp mill at the mine continues at work, and does its work well. You will remember we have a Krupp mill attached to the large mill. This Krupp mill is being worked against the stamps with a view to ascertain whether, in extending the reduction plant, we can use these Krupp mills with advantage, and this experiment will be shortly determined. As far as it has gone, the trial is much in favour of the stamps and against the Krupp mill. The combined plant is reported by Mr. Davey to be in a thoroughly efficient state, and is now easily dealing with two thousand tons of ore per month.

The main difficulty we have experienced at Waitekauri has arisen in connection with the extraction of the gold from the ore. This subject has been, and still is, important to us; it is not well understood—indeed, it is a technical question, and cannot be grasped in all its bearings except by experts who have a good knowledge of chemistry, and who have also good judgment and practical experience in the treatment of ores. I do not claim any such technical knowledge, but I know the general history of this question, and the relation of this history to our own ores. Wrong estimates of the facts of the case may lead to wrong conclusions, and if we understand the present position of the question it will save us from erroneous views of the value of our property. In quartz-mining there has always been difficulty in saving the gold from the ore. This has been so in the North Island of New Zealand, particularly in the Upper Thames District, where our mine is situate, and the difficulty has been greater in those cases where the gold in the ore is in a finely-divided condition. All the early attempts to save this fine gold by the ordinary method of wet-crushing and amalgamating with quicksilver failed; only small extractions were obtainable. To escape the causes which made wet-crushing a failure, and at the same time to avoid a second treatment of the ore, or handling the tailings after the crushing, a system of dry-crushing was adopted. In dry-crushing the ore is reduced in the stamper-boxes to a finely-divided powder. This dry pulverised ore is then passed into vats, and saturated with a solution of cyanide, which dissolves the gold; the gold is precipitated from the solution by a simple arrangement, and by this cyanide process, without another handing of the ore, in one operation we have been able in the most successful cases to save from 85 to 90 per cent. of the gold. This method has been very successful at Waihi, and has proved to be more or less suited to the clean oxidised ores found on the surface, or in the upper levels of the mines throughout the district. In the early history of the Waitekauri mine, the ore that was crushed was taken very naturally from the most accessible and convenient places, at or near the surface of the ground, where it had been oxidised by the action of the atmosphere acting upon the ore over long periods of time. This ore proved to be practically free-milling ore, and by the cyanide process good extractions were made from it; but even then the percentage of the extraction of gold at Waitekauri never came quite up to the large extraction obtained at Waihi. The ore in every mine varies in its character, and the cyanide is not equally efficacious in dissolving the gold in every kind of ore; and this variation in the character of the ore sometimes applies to every lode in the same mine. Different kinds of ore will be found in the same lode, and it is only by close attention to the peculiarities of the ore in every instance that the best results can be obtained by the cyanide process. At the outset of the dry-crushing system at Waihi we met with the same difficulties, and they lasted for some time, and gave us a great deal of trouble; but, by constant watchfulness and care, and after considerable experience, we succeeded, and secured the good result we are getting there now. There is no doubt but that the system which has proved so suitable to the oxidised ores found in the upper levels of these mines does and will require modification from time to time for the successful treatment of the ore found in the lower levels. That is the position we are in at the present time with some of our ore at Waitekauri. The ore from the upper part of the mine presents no great difficulty, the ore from the deeper levels is more difficult to treat; but what I wish to impress upon you very strongly, for it is a matter of the greatest importance to us, is that these difficulties are not insuperable. We have had the ore analysed by the best chemists in England, and they say it is not a refractory ore, commonly so called; it does not contain base metals, nor are there conditions with it which cannot be overcome. We have treated it successfully, and are doing so now: it requires technical skill, and continued vigilance and care. The difficulties of treatment by the cyanide process at Waitekauri last year were increased and the solution of them retarded by the unfortunate absence of the company's chief officer, who for some time had charge of the cyanide department, but who from severe illness at the end of last year had to leave our service at a critical time, just when we began using ore that was not oxidised, and which required the utmost skill and knowledge in its treatment. The cyanide process is new in New Zealand, and experts are few, and when their services are secured they have a good deal to learn of the different characteristics of the ore they have to treat, and so the loss of an able expert having this peculiar knowledge gained in our service proved a serious one at that important time. But this business is well in hand under the control of a capable staff, which we shall seek to maintain in efficiency. Mr. McLennan, who is now in charge of the cyanide works, is an experienced chemist, who came to us with high testimonials from South Africa, where he had done good work. Under his care the extraction has improved—the whole position has improved. He understands his work, and I feel sure we may depend upon his department for a satisfactory solution of these questions from time to time as they arise and the work proceeds.

The monthly returns have shown variations in amount from several causes. Some of these differences have occurred recently, and probably have been due to the cleaning-up at the end of the month. When the clean-up has not been thorough and exhaustive, the month's return would be smaller than it should have been, but the next month's return would get the benefit of part of the preceding month's work. Several times a small return has been due to a larger than the average quantity of low-grade ore having been sent to the mill; we have not been selecting the ore, we have been crushing everything straight before us as it comes out of the reef. By a recent letter from Mr. Davey, we learn that on more than one occasion a larger quantity, more than the average of low-grade ore, was sent out of the mine, and this extra quantity of low-grade ore had influenced the returns for two months, but more attention is being paid to this matter, and he felt confident that the following returns would be better, and the last return is better. Too much importance, however, is attached to these monthly returns; a small return which may be due to an accident is looked upon by many as a disaster, while over an exceptionally large one shareholders are apt to be unduly elated; these monthly returns have not such great significance. It would be more satisfactory, and the results would be more representative, if the returns were made quarterly instead of monthly.

I think now I have said everything I have to say upon the question of the extraction of the gold from the ore, and I proceed to notice the quality of the ore we have been dealing with, and may reasonably expect to get in the future. You will remember at the last annual meeting I drew your attention to the fact that the value of ore in the lode varied in the adjoining stopes. I gave you figures to show how much some of the differences were. More extended stoping of the reef in both levels confirms the facts I then stated, and this varied quality of the stopes prevails in the main run in both levels as far as we have gone, but the whole of the mass of stone in this large reef within the limits of the main run is more than payable, and when treated on a large scale will be highly payable. We have had a map made showing the value of the ore taken from each stope in both levels up to most recent dates, and you can examine this map at the office, and see for yourselves the quality of the stone. As far as the work has proceeded upon the No. 1 level, and has proved the value of the lode, the average is not so high as the ore in and above Corbett's level, but except for the small section referred to in Mr. Davey's report, it is all payable, and large parts of it very good indeed. This level is still being driven northward on the course of the lode in payable ore, and up to the date of Mr. Davey's annual report he reported having added to the resources of the mine in this level from 300 ft. to 400 ft. in length of good payable ore. I think it very likely that the ore in the upper part of the block between Corbett's level and No. 1 level will contain ore of high grade, for undoubtedly rich ore remained underfoot in Corbett's level.

Mr. Davey, who is our general superintendent, and has had considerable experience of large mining operations in other parts of the world, expresses his view of the mining position in clear and satisfactory terms in his annual report now in your hands, and I cannot do better than to ask you to read it carefully for yourselves. In a subsequent official report made to the directors, he says: "I believe you have a first-rate property here, and when it is opened up as it should be will prove a profitable concern." The ore in the No. 2 level should be good. If the value of the ore in the "main run" continues as good in the No. 2 level as it is in the No. 1 level overhead, I shall be satisfied, but we may reasonably expect it to be better than No. 1 level. A poorer level between richer levels is a common occurrence, and looking to the magnitude and strength of this run of gold, which has extended for upwards of 500 ft. in length, and has lasted downwards for 200 ft. in this large reef of unusual size, and which presents all the features of strength and permanence, there is good reason to expect that the No. 2 level will prove as good, if not better, than No. 1 level. The battery level is on the same plane as the No. 1 level, and the Premier and Battery runs of gold were worked from this battery level upwards. Both runs of gold were much longer upon the line of the reef in the level than they were at the surface. They have increased in length as they descended from the outcrop on the surface, and the reef at the battery level in each run has also increased in width on its downward course from the surface, and in each case good gold was left underfoot. There is thus in these facts very good ground for the expectation that the No. 2 level will prove a good level, and add largely to the richness and resources of the mine. The No. 1 level only gave us one block of 100 ft. deep on one of the runs of gold; the No. 2 level will give us blocks of 100 ft. deep on all three runs of gold, and each successive lower level will also in like manner command the three runs of gold overhead. The crosscuts from the two shafts now being driven to open the No. 2 level are progressing fast. We received a cable from the mine stating the position of these crosscuts ten days ago. At the No. 1 shaft we had left about 180 ft. to drive, and at the No. 2 shaft we had then left about 165 ft. to drive. We think the reef should be reached in both crosscuts within three months from the present time.

During the last financial year the working-expenses have been higher than we believe they will be in the future. Now that the mill is in full work, and that we are dealing with a larger tonnage, the milling charges should work out at a less figure. Moreover, during the year a change was made in the mine management, which meant delay and change of plans, and did not tend to economy at the moment. We have had to contend with delays in obtaining machinery and plant, during all which time the permanent staff had to be kept up. These and other matters incidental to a new and large industrial undertaking in a new district have tended to run up the working-charges beyond what they should be, and what we expect to see them in the future. The tramway between the mine and the mill is absolutely necessary to work the mine; without it we could not get the ore to the mill. This tramway is worked by horses, and the working-cost has been high. It should be lower now that the mill is in full work and larger quantities of ore are brought over the line. We must, as soon as possible, get rid of traction by horses, and work the line by a locomotive. Mining in New Zealand is expensive; it has been the fashion to represent it otherwise, but those who have a practical acquaintance with it know that it is. The country where the mines are situate is broken, the roads in the mining district are bad, wages are high, and the heavy rainfall makes the execution of outdoor work difficult and costly. All these, and the special taxation in the form of gold duty maintained by the Government, make mining operations in the North Island of New Zealand very costly. Apart from these considerations, which we cannot alter, we shall keep constantly before the management the great need to keep the mining- and milling-charges down to the lowest possible point consistent with the efficient working of the mine, and we have reason to believe that next year's accounts in this and other particulars also will show better results.

The limited works carried on in the Komata property during the year have not brought to light any new features. The explorations which we started in and about the old run of gold which proved so profitable to the previous owners became expensive from the difficulty of working through the old works, and we have had to suspend explorations there for the time. This run of gold was rich, and it has held good as far as we have gone down upon it. We intend to prospect it at greater depth, and we are about to do so by a shaft which will be sunk from the surface. We shall not require pumps, as the ground is high, and there is no water in the old works, and we shall probably defer the establishment of the Komata as a separate property until we get to know more about the extent of this gold in greater depth at this part of the mine. We are continuing the low level into the Komata, but it will take some time before it will reach the part of the mine where this gold is known to exist, and meantime, without serious outlay, we shall explore this part of the mine by sinking the shaft.

A few words about the old Waitekauri Mine. You will observe a note appended to the printed report stating that a rich vein of ore had been struck in this property. We have nothing more than telegraphic information. It is about 2 ft. in width, and is reported in the latest telegram to have been driven upon for 15 ft. and to be worth £25 a ton. This property was included in the purchase from the old proprietors when the company was formed. It is about 10 acres in extent, and has had a good history, for many years ago the owners took out of surface workings in it a large amount—I believe, upwards of £70,000 in value—of gold. If this lode upon which we are now working continues rich throughout the property it will become a valuable asset to the company.

To summarise the position, we began too soon; the mill was started before it was ready. The mine was not thoroughly opened up. We should have waited at least another year or two, and have been more thoroughly prepared for dealing with a large output. We should at the same time have acquired more experience in the treatment of the ore from the deeper levels. But we have been steadily improving our position. The cyanide department is well in hand, the results are much better, the returns are improving, and there is no reason why they should not continue to improve. The mining position is good. Every day the mine is being opened up more extensively. We shall shortly have the No. 2 level opened upon all three runs of gold. We shall use our best endeavours to reduce the cost of mining and milling. Our officers in the colony take a keen interest in their work, and I believe that we have entered upon a period of steady progress and success. With these observations I have to move, "That the report and statement of accounts to 31st May, 1897, as submitted to this meeting, be received and adopted."

Mr. H. J. Bristow seconded the motion.

Replying to questions asked by shareholders, the chairman said, as far as they could tell, the lode was the same width in the low-level tunnel as it was in Corbett's level. The whole width of the payable ore was taken out and sent to the mill, and that accounted for the somewhat low returns they had been having. They did not propose to increase the number of stamps until they had proved the No. 2 level. Their percentage of extraction was very satisfactory. They had already had samples of the ore tested in London by experts, who assured them that there was nothing that would prevent the action of cyanide upon it, and further similar tests were now being made. As far as he could judge, the cost of mining and milling the ore should be about £1 10s. a ton—it was a little more last year.

The resolution was then put and carried unanimously.

The auditor, Mr. C. T. Moore, F.C.A., was re-elected, and a vote of thanks to the chairman and directors concluded the meeting.—*Mining Journal.*

WATER-CONSERVATION IN OTAGO.

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Acting under instructions from the Under-Secretary of the Mines Department, Mr. T. Perham, C.E., of the Public Works Department, visited Otago a few months ago to report on a scheme of water-conservation for mining and irrigation purposes, but, owing to the time being short and the accumulation of snow on the hills, many places which he had intended to visit could not be examined. The following extracts deal more particularly with regard to water-conservation for mining purposes:—

Eweburn Dam.

The site is about six miles from Naseby, in a north-westerly direction, and about 200 ft. above the Court-house, in a valley under Mount Ida, and just above where the Mount Ida Water-race takes the water from the West Eweburn. It is a flat valley, confined at the entrance, and widens out at the back, and is in every respect suitable for a reservoir, provided the nature of the ground for foundation of the dam is proved to be favourable.

Mr. R. H. Browne, Maniototo County engineer, who surveyed for and designed the dam, accompanied me to make an examination of the line of foundation, and to consult generally upon the manner and cost of construction. Considerable doubts have been expressed by engineers who have examined the site as to the nature of the bottom being sound enough to prevent leakage, and have recommended pits being sunk or borings taken to determine the bed-rock. I concur in this, and have marked on the sketch-plan attached the positions in which the work should be done on line A B.

Looking up the valley from the race fluming and on the right bank of the stream the rock (sound schist) is almost perpendicular, and the strata lies in a favourable inclination—that is, leaning away from the water or reservoir side—and would form at the base a suitable foundation on the centre-line of dam as far as the creek. On the left bank, however, the terrace or spur against which that end of the dam would rest is gravel-wash, and clay overlying schist, which crops out sharply on that side of the creek. It then seems to dip considerably, and it is here the boring is required. It may, I think, be found that a puddled core could be stepped in the rock, called "Maori bottom," generally overlying the schist rock, and, if so, Mr. Browne agrees with me there would be no leakage. Good clay can be obtained by sinking near the site in the terrace up the valley for the core.

It has been suggested to bore higher up, with a view of finding more favourable ground, and shift the site, but in my opinion this is not wanted. I consider, however, that the centre-line of dam should be taken on the line of borings shown on line A B, for the reason that the dam will be of less depth at this (terrace) end, will have a better backing against the bend of the terrace, and will be less costly. I estimate cost of boring at £150, and recommend that arrangement be made for Mr. Browne to superintend, subject to consent of County Council.

Rainfall and Drainage-area.

The rainfall here, and all over the Maniototo Plain, is so slight—from all information I could obtain only 13 in. annually—that it is hardly worth taking into account, as evaporation and leakage from various causes would consume it.

The drainage-area at the reservoir-site is limited, and confined to the top of the low ridge on one side, and the terrace on the other, both steep to the reservoir. The creek runs out at the head of the valley, and is the under-drainage of the snow. To fill the reservoir the water is almost entirely dependent on melting snow down a large gully from the summit of Mount Ida. In such a locality there is no sure or even average data to base calculations upon, as much depends on the frequency of frosts or otherwise to withhold the snow-water, or discharge it intermittently during the warm winds and rains of October and November, or, in fact, with any degree of regularity. This applies not only to the source of supply for this reservoir, but generally over the whole of the centre of Otago, and especially the Maniototo Plain.

During the end of summer, autumn, and winter months all the creeks are mere shingle-beds, with perhaps in some cases water percolating underneath. At the melting of the snow in spring they become mountain torrents, and it is then that the water on the low levels must be conserved for midsummer, autumn, and winter use. The necessity for strong dams to withstand the rush of water is obvious.

It is considered, if the dam is built, it will supply all demands for six years. Then, if claims are worked out, the water can be utilised for a complete and extended system of irrigation, or a race can be taken across to supply the Little Kyeburn and portion of Spec Gully. With the exception of the two winter months, July and August, when operations cease on account of frost, the Government race, supplemented by the Eweburn reservoir, will keep all the miners employed all the year round.

The Mount Ida Race at present supplies six heads and a half. This is barely half a supply. There is wanted from the proposed dam, for about two months and a half, twelve heads running night and day; and providing for future wants and extension, twenty-four heads. All the water in Spec Gully is in the hands of companies. The Government race will not reach there, and water is from other sources difficult to obtain. From year's end—March, 1897—the increase in consumption was 5·25 over that of same date in 1896.

Each elevator working by day only employs six men, and uses four heads an elevator. The elevators, in the event of the dam being constructed, could work night and day, or employ two elevators in place of one now. From the above information, supplied by Mr. Murray, the water-race manager, and others, it appears that the majority of the water from the dam is likely to be consumed by the miners for elevating and sluicing, and that other provision should be made for irrigation purposes.

Mr. Browne estimates the "area enclosed by a dam 70 ft. high to be about 50 acres; and the contents of the reservoir once filled, about 58,000,000 cubic feet, or 361,181,250 gallons of water, which means a capacity of thirty Government sluice-heads for sixty-six days of eight hours, or twenty heads for a hundred days; and, taking the scale at 8s. 4d. per head per day, a revenue of £883 odd, which would yield 8 to 10 per cent. on cost of construction at £10,000."

Having doubts under the conditions above stated as to the rainfall, drainage-area, and dependence on the melting snow, I would recommend that the dam should be raised only at first, say, 50 ft. instead of 70 ft., provision being made on the lines laid down for the foundation for a future extension if the source of supply is found to justify the additional outlay. The water conserved would be about a third less than with the 70 ft. dam, and would supply about twenty heads for forty-four days of eight hours. The by-wash could be carried as originally designed by a tunnel or cutting through the rock round into the gully which opens into the Eweburn at the race fluming, the outlet being afterwards raised to the required level in the event of the addition being constructed.

There is already a tunnel roughly cut carrying the water of the Eweburn into the Government race, in which the discharge-pipe would be laid in concrete for the dam. I do not think it necessary to provide for a flushing-pipe. The silt likely to accumulate in the reservoir will, from the nature of the ground, be small, and it will tend to caulk and solidify the water side of the dam.

In the method of construction I differ from Mr. Browne, who favours sluicing in the material, which is often done by miners when and where water-power is available, but in this case it involves the expense of making a small catch-water dam at a sufficient elevation and laying pipes for the purpose. All the material can be obtained and run out from the spur or terrace direct on the dam on the left bank of the creek, and there is an abundant supply of sound rock for facing the inner or water slope. The outlet will join the Government race, and from that point to Naseby the race must be enlarged to carry the additional supply of water, at a cost estimated by the manager at £500.

Having as yet no definite information as to the nature of the bottom until the result of the borings are known, any estimate for a dam as I propose, say, 50 ft. in height, can only be roughly approximate. I am of opinion, however, that it may be constructed for a sum between £6,500 and £7,000.

St. Bathan's Company's Sludge-channel.

This channel, which seems to have had a varied history, runs from the road-bridge at the township towards, and is discharged into, the Dunstan Creek. The upper end is in fairly good condition, but here and there the walls require repairing. The lower end is completely blocked with tailings and fine silt, the result of the channel not being confined to its proper course by sufficiently-strong guide-walls. The gaps in the walls allow the water-borne tailings to escape and spread over the surrounding land to such an extent that new waterways are cut in all directions, leaving the "channel" in many places high and dry. There is a good fall for scour of 25 ft. to the mile. Proper material for the walls is expensive and difficult to obtain, the only scrub to be got for fascine-work being what is locally called "matakauri," at best unsuitable for the purpose. The walls were built of stone (round) and sods, and have nothing to bind them in position, and they have no batter. Well-bound fascines should be laid and staked well down, and stone placed at the back and on top.

There is an insufficiency of water to properly scour the channel of *débris* and the gravel and sludge from the daily working of the claims. It appears to be a matter of vital importance to the district. The channel is being maintained by the Channel Company, which has the control of the present head-water, and I am of opinion that if ordinary care had been taken to keep the lower end clear at the junction with the Dunstan Creek no trouble would have occurred. I do not think it can be put in a proper state to do the work required of it under at least £2,000.

It is proposed that the Government shall be asked to grant a subsidy of £1 for £1 for four years at the rate of £250 per annum, which I recommend for favourable consideration.

Muddy Creek Sludge-channel.

This channel is about four miles in length, discharges into the Manuherikia River, and is badly in want of repairs and training. From the claims down to the Main Road Bridge, about two miles, the first portion (which is deep) is choked up in three several places by the slipping and falling-in of the banks. These places require forming and piling with slabs to keep it clear for the use of the tail-races, at a cost of about £500. Timber is expensive, or open culverts would be better and more lasting.

At the Main Road Bridge the road has had to be diverted, on account of the tailings backing the water up the Clear Creek. This place is very inconvenient for crossing at the ford, and, in times of flood, after the melting of the snow, dangerous for road-traffic. Below the bridge to the discharge into the river is about two miles and a quarter. The training-banks on both sides are broken, and the water and tailings run in all directions, filling up the large area on the right bank even to the terraces.

The channel (or what was originally so constructed) in this lower mile is completely blocked, and in many places is actually higher than the surrounding level of tailings. Where the channel discharges into the river there is a heavy accumulation of fine silt, requiring strongly-constructed training-walls to free the sludge from above and keep the mouth open. This portion of the channel has been formed in an inexpensive manner, by driving blue-gum posts in double rows and straining fencing-wire from post to post, weaving in and tying thereto matakauri scrub. The posts are not by any means close enough together to stand the weight of tailings and water, hence the gaps and overflows. I consider to put this channel in order £2,000 will be required below the bridge to the junction with the river, and at the junction another £1,000 to free and keep it open into the Manuherikia River—£3,500 in all. A pound-for-pound subsidy is asked for to the extent of

£2,000, to extend over four years. I am of opinion, however, that the work has been underestimated. I advised the manager, Mr. Nicholson, who is doing his best with the limited funds and poor material at hand, as to the best method of carrying on the work.

OPHIR (BLACK'S).

White Horse, or Blackstone Hill, Water-race.—A private company own a race about ten miles in length, catching the water from the Manuherikia River above the falls, and require to extend it three miles to reach payable ground. The company will hand over the constructed portion and all prior rights to the Government, at a price to be settled by arbitration. Claim, fifty-five heads of water. It is reported that the race will command payable ground at Poolburn, about ten miles further on.

IDA VALLEY.

A long narrow flat valley between the Raggedy Range and the Rough Ridge, draining towards the centre from both ends, from the Idaburn by the north and the Poolburn from the south, the two streams uniting and cutting through a deep gorge in Raggedy Ridge, and running into the Manuherikia River. The soil is fertile, and the contour of the country of a similar character to that of the Maniototo Plain, but, in proportion, with a larger extent of flat in the centre.

As before mentioned, the reservoir in the gorge of the Idaburn commands the country over the Poolburn Gorge to the end of the valley for irrigation purposes, and I now purpose to deal with the south end.

Moa Creek.

Here the first place visited was the Moa Creek Gorge, and a site was selected about two miles and a half from and 100 ft. above the opening of the gorge. The reservoir would cover about 25 acres, and command all the highest spurs and terraces on the plain. A rock-dam or weir 45 ft. in height and about 2 chains in length would be wanted, and a head-race in unavoidable rock-cutting about three miles in length. This reservoir would also command the Hard Hill and other low-level gold-workings. But, unfortunately, like many of these rock-bound gorges, in places it is narrow and deep, with broken almost perpendicular sides, then opens out behind and forms a favourable site for a good reservoir; but the bed of the stream is steep, and the dam requires height to gain any depth of water. Again, the strata of the rock is erratic and shattered, raising doubts as to its capability of retaining water after the dam is built, and, although as a reservoir for storage and distribution it has almost every advantage that could be desired, I fear it would be subject to interior leakage.

O'Keefe's.

A permanent creek running from the Rough Ridge, with a private dam in use and other prior rights. Another small dam in the gorge higher up could be built as a catch-water for conservation during summer months, and would also be of use to miners on the low levels of German Hill. The miners do not object to a dam or weir if the same amount of water they now draw can be guaranteed, with an additional supply from the storage.

I think this is one of the localities where such an arrangement could be made with advantage both to the farmers and miners, and at comparatively small cost to the Government.

Bread and Water Gully.

Local miners advocate the erection of a dam which would supply part of German Hill gold-workings and irrigation on the eastern side of the plain, but a suitable site is not obtainable, the gorge being too narrow and steep.

I was shown some coarse gold here just washed out, and the miners speak hopefully of the locality (even expecting a rush) if water can be obtained. This creek runs about six heads, and is well worth conserving for the low levels, both for mining and irrigation.

Head-waters, Poolburn.

I heard much of this site from all quarters, as it is well known to command all the high levels of German Hill. It is 1,200 ft. above the "Carriers' Arms," on the margin of the plain, near which mining is carried on.

A rock-bound gorge requiring a dam 3 chains in length and 50 ft. high would throw the water back about a mile and three-quarters, averaging half a mile wide, and roughly 20 ft. in depth. Like the Eweburn Dam at Naseby, however, the site of the foundation is doubtful, and would require trial borings. The creek is permanent, and runs at a minimum in the driest season of about seven heads. For mining purposes it is undoubtedly a good site for a large conservation, on account of its elevation, but, as it commands only the south-eastern side of the valley embracing German Hill and contiguous workings, I do not think, under existing circumstances, a large expenditure justifiable. It is one of those places, looking to the future, however, of the gold-mining industry, that may become a valuable acquisition.

My visit to this site concluded my examination. From the south end of the plain to the Poolburn Gorge there is no indication of sites for water-storage along the Raggedy Ridge, and for irrigation purposes the water will have to be brought round the foot-hills from the eastward. That water is urgently required is beyond doubt.

MATAKANUI, OR "TINKER'S," THOMSON CREEK DAM.

From Ophir I next went to Tinker's, with the intention of inspecting the site of a proposed dam or dams in Thomson's Gorge, and was met by Mr. Shephard, County Chairman. Unfortunately, on my arrival the hills were completely enveloped in mist, which afterwards turned to sleet and rain, and it was considered useless to wait another day on the chance of a personal inspection.

Mr. R. H. Browne, C.E., made the surveys and got out the plans for Mr. John Ewing, of St. Bathan's, who kindly forwarded them to me afterwards at Clyde, together with notes on the rainfall, drainage-area, holding-capacity, &c. From the notes it appears the rainfall does not exceed 20 in. annually, although Mr. Ewing says, "I have seen streams I estimated at 800 heads coming down the creeks in floods. Such a stream would not continue for more than twenty-four hours, but it would take a week to get down to 100 heads. A rainfall of 5 in. in one week sometimes occurs. I think after such the dam might, if the ground were fairly saturated with water before it came, get half full. . . The catchment-area is 15,349 acres, mostly steep and rocky, and for six months in the year all moisture falls as snow."

The plans and sections show a steep creek with two branches, the waters running together about eleven heads. Both gorges are deep and narrow, and it is proposed to trap the water just below the junction of the branches. There is an alternative scheme, however, for a dam in the left-hand branch, 118 ft. high and 395 ft. in length on the top.

A dam is also shown on the plans 150 ft. high and 540 ft. long on the top, estimated to conserve about 294,000,000 cubic feet of water. There is necessity here for high dams, the creek-beds being so steep, deep, and narrow; but this work would be very costly.

A 100 ft. dam just below the junction of the two creeks seems to be the one advocated, and certainly would be the most useful and practicable. It is 388 ft. long on the crest, and the water is intended to flow over like a weir, stone pitched both back and front, and is estimated to store in both branches 88,726,188 cubic feet of water, equal to 1,026 heads for twenty-four hours.

There is no estimate of cost given in either case. I have, however, taken the quantities, on prices given me for similar work in the neighbourhood, of the 100 ft. dam, and formed the approximate estimate (supposing the foundations are favourable, &c.) to be £38,500. This is an undertaking I think will be considered of too great a magnitude to entertain.

Here, as elsewhere, there is a great demand for water for mining, but it is difficult to obtain.

Mr. Naylor, of the Clyde, has a fine farm here on the Ophir Road, showing what can be done with the soil by the means of a simple system of irrigation.

LAKE ONSLOW, OR DISMAL SWAMP, DAM.

So late in the season, and the weather very unsettled, it was considered by experienced residents a risk of being snowed up to attempt to visit this dam. My assistant, however, Mr McKegg, volunteered to undertake it, and, a reliable guide being procured, I left him at Roxburgh to go up from there, take measurements, and obtain all information required in view of the dam being raised. I then went on to Miller's Flat, and met by appointment a number of local members of the Miners' Association, and found the agitation for an increased supply of water by an addition to the dam very strong, the general opinion being a desire to raise the dam as much as 20 ft. or 30 ft. I cannot recommend this idea for reasons shown hereafter. The area of payable ground the lake is reported to command is of great extent, from Roxburgh to Beaumont. A large alluvial flat on the left bank of the Clutha at Miller's Flat and another containing 1,300 acres are much talked of as being rich if water can be obtained for sluicing and elevating.

It is claimed that if the dam is raised only 10 ft. it will impound three times the quantity of water the lake now holds. I am, however, unable to give the approximate contents of the conservation by the present dam, having only a plan and no cross-sections. The area is 1,500 acres, and the watershed supposed to cover eighty-four square miles, and, as the dam is 23 ft. in height and the lake-bed nearly flat, with the surplus water running over the top of the dam, there must be many millions of cubic feet in store.

The dam is in the Lammerlaw Range, about twenty-three miles from and 960 ft. above Roxburgh, and is of stone courses set in cement mortar quarried on the site. It is a solid well-built structure of its kind, nearly vertical at the back or water side, and stepped to a batter in front, with an unfinished course on the top of 6 ft. It has two iron outlet-pipes, with sluice-valves worked by screws, and a sludge-pipe. The dam appears to have been built in two parts—18 ft. at first by Mr. Rawlins, with another 5 ft. added since by Mr. Davey, of Dunedin, who kindly lent me the plans. It was built for and is the property of the Roxburgh Amalgamated Gold-mining Company.

The section shows a height of 23 ft. and a base of 28 ft. The total cost of the whole structure I found rather complicated and difficult to obtain, but it is generally—or, rather, variously—stated to be between £3,000 and £4,000. Computing the quantities, however, from Mr. Davey's section, and the contract prices furnished by him, it should have cost about £3,650; so that the recent offer of the company to dispose of the dam for £6,000 and the reservation intact of the existing rights in the reservoir to the company, it seems to me, should not be accepted.

The company hold a prior right to the water in the lake, and, in addition, there are no less than thirteen existing rights, with a total of 184 Government heads of water. It therefore appears that if the water is continuously drawn upon to this extent it is a question whether, except in times of an abnormal flood of melting snow or rainfall, the lake-level would remain at another 10 ft. over such a large area as 1,500 acres.

Attached is a plan of the lake and a cross-section of the existing dam with the proposed addition shown of 10 ft. The base is sufficiently wide and strong to carry this at the same stepped batter with a width on the top of 6 ft., and an extension of the outset or plinth for the lifting-gear for the sluices of 2 ft. on the top.

The dam in its present form should not, in my opinion, be raised more than 10 ft., and I estimate the cost of that addition at £1,260. This is not a large amount for such work if it could be shown that the mining interest generally would be benefited thereby, but I cannot help thinking that the only gainers under the circumstances would be the Roxburgh Amalgamated Gold-mining Company and the owners of the existing prior rights.

LAWRENCE AND UPPER WAIPORI.

From Miller's Flat to Lawrence along the road there are numerous fruit farms and gardens, which seem from their appearance to be well watered by the creeks and streams running in the gullies from the foot-hills, and from inquiries I found there was no great demand for water for irrigation purposes.

At Lawrence the only demand I heard of for mining purposes was a desire for a dam up the River Beaumont to work the river-bed and auriferous terraces in the vicinity. By report, a dam would be required 45 ft. in height and 140 ft. in length to form a reservoir of about 800 acres. A race three miles and a half in length would bring the water on the ground at 700 ft. elevation. There are several existing prior rights above the dam to be considered.

As I had determined to push on to Upper Waipori, where it was reported water was required for mining, I did not inspect this site.

I may here mention that the Blue Spur Company own several small dams in the surrounding hills, from which water is drawn for working the claim, which had stopped operations through the pipes and boxes being frozen.

Upper Waipori.

There is a demand for water here, and on arrival I was told of a suitable site in Long Gully, about five miles from the township, the water depending on melting snow and a small stream running about one head and a half, with a fair watershed and drainage-area. It is reported to be a narrow rocky gorge, opening out behind in a small flat, in the usual manner in these places. I regret to say that I could not go up to inspect it as the hills were enveloped in a dense mist, and, being advised the weather would be likely to continue so for several days, to avoid useless expense in horse-hire, &c., I returned the same day to Lawrence.

The OPQ and the Blue Spur companies hold prior rights to the head-waters of the Waipori River.

Conclusion.

It will be gathered, I think, from the foregoing that water is, both for mining and irrigation purposes, urgently required in Central Otago. The numerous prior rights monopolizing the water in all the principal creeks and streams is a serious drawback in the way of even any moderate system of water-conservation, involving as it would the extinguishment of rights either by purchase or compensation. Still, I am inclined to think that for mutual benefit there are instances in which equitable arrangement may be made, so that the owners of existing rights shall receive their granted number of heads of water, and, in addition, the advantage of a supply from conservation in the dry time of year. That the conditions have not been complied with in many cases I am sure there is little doubt, and after a searching investigation they could be cancelled.

Speaking generally, it may be well to mention that of the two, although both are of great importance, I think water is required more for irrigation than mining.

THE KLONDYKE GOLDFIELDS.

VERY few other than officers and men of the Mounted Police, whose services are likely to be sorely needed to maintain order this winter amongst a population of desperate because cold and hungry miners, are now leaving British Columbia for the Klondyke Goldfields. All sensible men here recognise that it is necessary for the prospector to wait till spring, unless he wishes to take his life in his hand and risk it quite unnecessarily. Hence, acting upon advice to this effect, many would-be gold-seekers in the Yukon, making thither *viâ* British Columbia, are wintering in Vancouver, Victoria, and New Westminster. The warning attitude of the *Mining Journal's* editorial policy in regard to the Klondyke gold excitement is here commended by such old northern placer miners of solid judgment as happen to be aware of the advice given your readers, whilst the pretensions to knowledge of the Yukon asserted by some directors of hostile organized Yukon syndicates formed lately in London are here regarded with derision.

There are men thus posing whose only knowledge of mining in Western Canada rests on the basis of a hasty visit to West Kootenay, made either in the course of a sporting or political tour, *plus* a few days stay and occasional conversation with mining-men at the comfortable Hotel Vancouver. The want of knowledge of far northern circumstances displayed by certain attempting company promoters would also be ludicrous were it not lamentable by reason of the possibility of its duping the British investor. Thus one promoter had an idea of sending cycles and candles to the Yukon, and utilising for transport the services of Ramsgate fishing-smacks, utterly incapable of safely "rounding the Horn," to say nothing of the perils of the rough northern navigation of Behring Sea. Would-be British investors in Yukon companies will do well also to remember that many—probably most—of the telegrams sent to England *viâ* Victoria, Seattle, and New York exaggerate greatly the gold as yet got and brought out, this being often done deliberately to promote travel and outfit trade.

The Western American news correspondent is a born "boomer," and seldom fails to use any opportunity afforded him when he thinks it can be made to enhance the temporary profits of the people of his town. There is absolutely no trustworthy evidence yet available to show that the Yukon's gold output of the season 1896–97 exceeds some $5,000,000 at the highest estimate, whilst in all probability it will be found considerably less than this total, which, divided amongst those engaged, means no more than fair wages for such a country in the case of most, and moderate fortunes for a very small minority, though now that the "boom" is on many are selling their claims to syndicates and syndicate-promoters for "fancy prices" many times in excess of their real intrinsic values. "Old-timers" here declare, and point to statistics in proof, that the Klondyke is no richer than were the Cariboo placers of old; and these, after all, only brought wealth to a few, and never sustained a population of more than twenty thousand or thereabouts, whilst there were no hugely capitalised companies needing excessive profits in order to make the most moderate success. And the rich Cariboo placers yielded in all, during twenty years or so, not more than some $60,000,000. Yet the Klondyke companies of New York alone now ask for $100,000,000 of capital. The *Mining Journal* cannot, in your correspondent's opinion, strike too loud a note of warning as to the premature enthusiasm for the Klondyke, as famine and exposure will, long before the spring, cause bitter lament for many lost Klondykers. Already the Yukon death-roll—little noted by cable correspondents—is very large, typhoid fever, lung troubles, exhaustion, and drowning accidents having in a few weeks claimed victims, many and sturdy, amongst the Klondyke argonauts, many hundreds of whom are even now camping out in the cold under such conditions of self-neglect and exposure as are sure to prove fatal to a large percentage unless they speedily return to winter quarters in some town centre of civilised comfort.

The best news concerning the Klondyke—towards which, notwithstanding all possible warnings, there will be a big rush in and after the spring season of next year—is the intention of the Canadian Pacific Railway to inaugurate, in connection with its trans-continental and trans-oceanic services, a special steamship and railroad route to the Yukon Gold-fields, starting from Vancouver. A well-appointed coasting-steamer will in the spring carry passengers north, and at Glenora, on the Stickeen River, disembark them on a line of light railroad to be built between Glenora and Teslin Lake. From Teslin Lake and along the Yukon to a point near the gold-fields another C. P. R. steamer will carry the passengers in safety and fairly comfortably. There will be little difficulty for the company providing the steamship services, and the 100-mile connecting railroad is said to present no very special engineering difficulties. Already the surveys are being commenced, and doubtless, if the line be not all constructed by the spring, the company will then have part of the work accomplished, and by some other fairly efficient temporarily substituted means of travel provide for the transport of passengers over the short interval between Glenora and Teslin Lake. The proposed new route is almost certain to become the favourite one, facilitated as travel along it will be by all possible devices of well-directed capital and engineering skill, whilst the great Canadian Railroad will have the further advantage of being able to offer all the world through-bookings to the Yukon. The result of the undertaking will be of great importance to British Columbia, and more especially to Vancouver, which should become the great centre of outfitting and point of departure for the Yukon country, which will thus be reached at far less expense and infinitely less risk than now. The new service should also, by facilitating food and other transport, reduce greatly the present enormous cost of living in the Klondyke region.—British Columbia correspondent *Mining Journal* (London).

DEVELOPMENT OF LAKE SUPERIOR IRON-ORES.

THE following extracts from a paper read by Mr. D. H. Bacon before the American Institute of Mining Engineers will be of interest, in connection with the recent visit of Dr. Storer, Mr. Reginald Murray, Professor Black, and Mr. Alexander McKay to the Nelson District, where iron as well as copper exists :—

During the late fifties the ore-product of Lake Superior was handled over a mule tramroad to Marquette. Now the Duluth, South Shore, and Atlantic, the Chicago and North-western, the Wisconsin Central, the Duluth, Superior, and Western, the Duluth, Mesabi, and Northern, the Duluth and Iron Range, and the Lake Superior and Ishpeming Railroads serve the shippers. Up to nearly 1870 a 700-ton ship was an enormous craft, the loading of which required two days, the unloading being seldom accomplished in that time. Now the cargoes reach 5,000 tons, the loading requiring less than three hours, and the unloading ten hours. In 1871 the largest ore-barge carried 1,050 tons, and made twelve trips per season. Now the mines cover more land than was familiar to even the timber-cruiser when the Jackson Mine was opened. The annual shipments have grown from a few thousands to 10,000,000 tons, and the ability of the mines to produce is not taxed. Lake freights are one-eighth of early prices, and rail freights one-quarter.

The deeper waterways, commodious locks, and large ships of to-day are in a greater measure due to the movement of ore than to any other cause. Great savings have been made in each detail of each department. The only cost that has not been lessened, I am glad to say, is the cost for money paid to men, for wages, measured by what they will buy, are as high now as at any time past, except it were one of feverish activity.

As illustrating the cheapening that has been effected, ore is to-day sold at Lake Erie ports for $1 per ton less than in early times it actually cost to mine, and this is done without loss. And further economies may be expected. Young men remember sales of ore in Pittsburg at $18 per ton, or about the present price of rails.

The first mines were opened in Marquette County, and were of what is commonly known as "hard ore." Previous to 1873 soft ore, or "hæmatite," was not popular, but the buyer was often obliged to take some in order to secure the needed quantity of hard ore. In those good old days the ore-buyers came to the sellers as penitents approach the shrine, but I am told that custom in this respect has changed somewhat of late.

PUBLICATIONS RECEIVED.

"The Cyanide Process of Gold Extraction," by James Park, F.G.S., late Director of the Thames School of Mines. Third edition. From Chamtaloup & Cooper, publishers, Auckland.

"Report of the Department of Mines, for the Year 1896," with supplementary notes and maps. From the Mines Department, Western Australia.

"Annual Report for 1896." From the Ballarat School of Mines.

"Records of the Mines of South Australia: the German Reef, with notes and plan," by H. Y. L. Brown, F.G.S., Government Geologist, South Australia.

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NOTES AND COMMENTS.

THE quantity of gold exported for the month of October was 21,833 oz., valued at £83,555; and 19,751 oz. of silver, valued at £2,254. There is a steady increase in the output from the Ohinemuri Goldfield, the export from Auckland being the highest for any month recorded during the present year, while it was 6,210 oz. of gold and 9,451 oz. of silver more than was exported during the preceding month. The total gold export from the colony for the eleven months ending the 30th November was 233,660 oz., valued at £912,177; and 163,638 oz. of silver, valued at £18,669: making the total value of bullion exported £930,846. The shipments from the various ports during November were:—

Port.	Quantity. Oz.	Value. £
Auckland	14,314	53,654
Nelson	130	520
Greymouth	1,981	7,927
Dunedin	3,651	14,424
Invercargill	1,757	7,030
Totals for November ..	21,833	£83,555
Totals for eleven months of 1897	233,660	£912,177
Totals, Jan. 1, 1857, to Dec. 31, 1896 ..	13,313,907	£52,392,430

IN reporting the discovery of gold in the Taupo district to the Right Hon. the Premier, the prospectors (Messrs. G. Blake, W. A. Teague, and H. Wilcox) stated: "For the last six months we have been engaged prospecting a range of hills known as Hauhangaroa, about twenty miles from Tokaanu, and after hard work and many difficulties (Native, &c.) we can come to no other conclusion than that we have found a great alluvial goldfield. We have, of course, not been able to do more than examine the creeks with our dishes, and take note of the formation, but it seems sufficient as far as we know (not having a great knowledge of alluvial work) that a big thing exists; so we beg to inform you in as few words as possible what the result of our labour has been. We found splendid prospects in every creek, without exception, big and little, going from four or five up to as much as twenty and thirty colours to the dish. We were completely puzzled about the source of the gold, as not the sign of a bit of quartz could we see anywhere. We at last determined to try everything we came across, and at length discovered that the gold is contained in a kind of conglomerate lying on a coarse soft sandstone bottom. The extent of this must be enormous, as the same formation, and about the same average of gold, is in all the creeks we have been in for at least twenty-five miles, and no doubt the same exists right round the range. On development—sinking, &c.—what the field will prove remains to be seen, but we believe that hundreds of men could earn a living now sluicing the river-beds." The prospectors concluded by requesting to have their names placed on record for the reward offered for the discovery of a payable goldfield.

THE matter was brought under the notice of the Hon. the Minister of Mines in the House by Mr. Herries, M.H.R. for the Bay of Plenty, who asked,—(1.) Whether his attention has been called to the reported discovery of gold in the centre of the North Island? (2.) Whether the Government will during the recess consider the desirability of introducing legislation whereby prospecting and mining can be carried on on Native lands which have not passed through the Land Court, due consideration being given to the rights of Natives? In asking the question that stood in his name, he thought it hardly necessary to point out to the Minister and honourable members how important it would be to have a large goldfield in the centre of the North Island. He had been credibly informed that some prospectors who had been out had brought back something more than the "colour" of gold, but they had not been able to enter on certain reservations on account of the Native titles. A great deal of the land in the interior of the North Island had not been put through the Native Land Court, and of course the titles were not ascertained. He hoped the Government would, as he believed they could, bring in some legislation by which mining could be carried on on Native land which had not gone through the Native Land Court. —The Hon. Mr. Cadman said, in reply to the first part of the question, that his attention had been drawn to the discovery of gold in certain parts of the centre of the North Island. He could not quite agree with the honourable gentleman when he said that the greater part of the lands of the North Island had not been put through the Native Land Court, because he found by making inquiries that there was very little land left to be put through the Native Land Court. Had the honourable gentleman been in the last Parliament he would have seen the trouble they had with a Bill dealing with mining on private lands, and he would have probably recognised that it was rather a difficult subject to deal with. He could only say that, in dealing with this question of mining on private lands, he saw no reason why Native lands should be treated exceptionally, and, if they had to have legislation in this direction, then it would have to be made applicable to Europeans as well as to Maoris.

The discovery of gold in the Wade and Dairy Flat districts, situated about twenty miles north-east of Auckland, has been reported to the Hon. the Minister of Mines by Mr. W. Akers, of Lake Takapuna, who writes: "Would you kindly state if and what assistance would be given towards prospecting the Wade and Dairy Flat districts. In the latter district, and also in the Wade, which adjoins, prospecting has been carried on by a syndicate of working-men, with very encouraging results, for the past ten years; but owing to its being a poor district, and separated by a long distance from a goldfield, there has been a difficulty in getting capital to develop it. I am now in communication with a gentleman in Charters Towers, Queensland, who, I think, would undertake to thoroughly prove it, providing some assistance was given by Government. I would deem it a great favour if you would kindly let me know what assistance would be given. I may state that, within a radius of four miles, four different kinds of stone have been found, giving an assay result of bullion up to nearly £4 per ton. What we set most value on is a conglomerate deposit, which we have proved to be very extensive, and which yields about 6 dwt. of gold and over 1 oz. of silver per ton. This conglomerate mass is composed of water-worn pebbles and small pieces of quartz, and the analyst informs us that the gold is contained in the slime; that being so, then I think it is highly probable that heavy gold may be met with, as it appears to have once been in a liquid state; and, although this deposit is situated about three miles inland from the mouth of the Wade River, still some sharks' teeth were found in this deposit, so it must at one time have been a river or sea-bottom. I thought it advisable to mention this. For years past good-looking quartz has been found in the Wade district, and in several instances contained gold; and I think it highly probable, if moderate assistance were given towards prospecting, that a payable field would likely be opened up: in fact, it would not surprise me if something above the average were found. I may state that the present syndicate of working-men are settlers in the district, and I think I may say thoroughly honest and in earnest, and have no desire to misappropriate a penny for any other purpose than that for which it is asked, and, of course, are quite willing that the money should be spent under the strictest supervision and under the control of any one you may appoint." – As in all similar applications, Mr. Akers has been informed that before assistance can be given towards prospecting it will be necessary for the regulations for prospecting and payment of rewards for the discovery of goldfields to be adopted either by a prospecting association or the local governing body; and, in the event of an association being formed, it will be necessary for information to be supplied as to the amount of voluntary contributions by members, the name of the officer of the association who will operate upon the bank account, and the name of the bank at which the account will be kept. Before prospecting operations are commenced it will be necessary for one or more members of the association to procure prospecting licenses, by applying to the Governor, through the Commissioner of Crown Lands at Auckland, for a license or licenses to be issued under the provisions of section 90 of "The Mining Act, 1891." The fee for each license is £1, which will have to be paid at the time of making the application. No titles to mine for gold can, however, be issued until the localities have been included within a mining district and a Warden appointed; but mineral leases can be issued under subsection (*f*) of section 3 of "The Mining Act Amendment Act, 1892," authorising mining for minerals excepting gold, silver, and coal.

Some time ago it was announced that copper had been discovered in Omanu No. 2 Block, in Whangaroa County, and, as it has since been found that the deposit extends into and runs through the adjoining block—Kaingapipiwai No. 2—action is now being taken by the Native Lands Purchase Officer to obtain a deed of cession for mining purposes of that block from Taniora Arapata and the other owners. Prospecting operations at Omanu have revealed a large and valuable deposit of copper, and it has the advantage of being very convenient to a place for shipment.

THE Goldfields and Mines Committee, to which the Cyanide Process Gold-extraction Bill was referred, after the second reading had been taken *pro formâ*, decided to recommend that the amount of the purchase-money should be reduced from £15,000 to £10,000. An intimation has been received from the solicitors of the Cassel Gold-extracting Company that the company will accept the offer of £10,000 for their patent rights and the reservation expressed in clause 20 of the Bill enabling them to recover back royalties, the Bill to be passed this session, and the money to be promptly paid after its passage; but should the Bill not pass this session the agreement to purchase is to be at an end, and the company is to be free to proceed with the enforcement of their patent rights. The agreement entered into with the company for the purchase of the patent rights was published in the September issue of the *New Zealand Mines Record*, and a summary of the Bill in the October number.

MR. GUINNESS, M.H.R., gave notice to move, in the House of Representatives, on the 4th November, that, contingent on the motion for the second reading of the Mining Bill being agreed to, it be an instruction to the Committee on the Bill that provision should be made for the repeal of the rates on mining property, for the reduction of the rental of all licensed holdings and special claims from 10s. to 5s. per acre, for the reduction in the fee paid for miners' rights from 10s. to 5s., and for the payment of a royalty of 2s. per ounce on all gold won from the land. The royalty is paid in the North Island, and the money handed over to the local bodies for the making and maintenance of roads, bridges, &c.; but the duty was abolished in the South Island in 1890. There is a considerable diversity of opinion on the Westland and Otago Goldfields as to the advisableness of reimposing the gold duty; some arguing that without it the local bodies will be unable to properly exercise their functions, while others contend that the duty, if reimposed, would be too great a burthen to place upon the gold-mining industry.

REPLYING to Mr. McGowan, M.H.R. for the Thames, who asked if it was the intention of the Government to grant the relief to gold-mining companies asked for by the Chamber of Mines, Auckland, in regard to the increased taxation which they were likely to be subject to under the operation of the Land and Income Assessment Bill, the Right Hon. the Premier said the question had been dealt with by the Public Accounts Committee, and he thought the report was on the table. He might say, first of all, that if a mining company, under its articles of association, confined itself simply to mining, then it did not pay the additional tax; but if in the articles of association it embraced other business in addition, then by so doing it manifestly brought itself under the law, and would have to pay the additional tax: as a mining company, pure and simple, it would not have to do so. Then they came to the next question, as regards the payment of the income-tax upon half-dividends. All other companies, except mining companies, had to pay full income-tax on profits—not on half half-dividends, but on the whole of their profits. Timber companies paid on all profits, and coal companies paid on all profits. The proposed amendment was simply placing the mining companies on the same footing as all other companies. It had been urged that the mining companies paid export duty on gold, but that only applied to the North Island; in the South Island they did not do so. When the Gold Duty Abolition Act was being passed it was the North Island members who insisted on keeping the gold duty, stating that it was preferable to keep the gold duty to paying rates on mining property. All the money paid in the way of gold duty went for the maintenance and construction of roads by the local bodies; so that, although the companies paid duty, they got the whole of the money back—and more—in the construction and maintenance of roads. The alteration was made on two grounds: first, that there was a desire to place mining companies on the same footing as others; and, secondly, that mining companies had been evading the tax, and only paying on dividends, taking profits as money that ought to be included in dividends, and by doing work and making permanent improvements which properly should have been paid out of Capital Account. Consequently, there had been a loss, and it was owing to that evasion it had been decided to place them on the same plane as all other companies, who have to pay a tax on all profits; and then they would be unable to evade it. The total amount of the difference between what was payable now under the existing law and what would have had to be paid had the new system been insisted on was £3,000. So far as the Government were concerned, they wished to encourage the industry in every shape and form; they did not want to tax it unduly. As the companies expended money sometimes which was dead capital in sinking shafts and driving levels, the Committee considered it better to continue under the old law. If there was a fair compliance with the law, and evasion ceased, he would not press the matter further; but if it were found that similar attempts were made as in the past, they would certainly ask for legislation to place mining companies on the same footing as other companies.

A SAMPLE of jet coal obtained at Maharahara, Hawke's Bay, about ninety miles from Napier, was sent to the Right Hon. the Premier while in London by Mr. R. S. Florance, solicitor, Woodville, with the view of ascertaining its value for the manufacture of ornaments, &c. The Agent-General submitted the sample to Messrs. Johnson, Matthey, and Co., of Hutton Gardens, London, for the purpose of examination and testing as regards its commercial value. They reported that the mineral in question is, by reason of its inferior quality, of no market value for the manufacture of jet ornaments, as it is of a nature which cannot be worked up satisfactorily. The difficulty, probably, is due to its want of tenacity. Possibly a more compact and solid mineral may be found at a greater depth, but it is difficult to give any definite opinion upon this point. This agrees with the concluding remarks of the report sent in to the Under-Secretary of the Mines Department by Mr. Alexander McKay, Government Geologist, on the 18th May, 1896: "Since the first samples were sent to the Mines Department and analysed by Mr. Skey, they have been subjected to various tests, in order to prove how the substance stands the elimination of its accidental, and in part of its constitutional, water without rending or crumbling to pieces during the dessicatory process. So far as these tests have gone, they show that unless very slowly dried the substance does crack to some extent, and this, together with the fact that, compared with Whitby jet, it is somewhat brittle, unfits it for the purposes to which jet is usually applied."

A DISCOVERY of cinnabar was reported a few months ago at Maungakirikiri, a branch of the Kauaeranga River, distant about eight miles from the Thames. A sample recently brought to the School of Mines by one of the prospectors showed a little cinnabar in quartz, but the quantity will have to be greater than in the specimens shown to render the working of the lode, which is stated to be a large one, payable.

ONE of the students at the Thames School of Mines received a sample of oil-shale from Kotuku, near Lake Brunner, on the west coast of the Middle Island. His analysis showed: Specific gravity, 0·899; and 76 per cent. of oil on distillation.

A REPORT has been received in reference to an accident which occurred at the Low Level Tunnel at Black's Point, Reefton, the property of the Consolidated Goldfields of New Zealand (Limited). A miner named Oscar Brundell had his leg broken while working at the air-winch, which is an ordinary one, driven by compressed air, the working of it being very simple. Brundell was employed to truck from the working-faces in the mine to the air-winch, which is situated in the main tunnel, about 4,000 ft. from the mouth of the surface entrance. The duty of the truckers, when working the air-winch, is to see that the wire rope is securely fastened to the trucks before sending them to the mouth of the tunnel, and on their return to be at the air-winch to put it into gear and to regulate the air while the empty trucks are being brought in. Before putting on the air, and while the winding-drum is out of gear, it is the custom to turn the drum round by hand to haul in any slack rope that may be lying on the floor of the tunnel. This being done, ordinary care is taken to turn on the air and set the winch in motion; but in the instance referred to circumstances point to the neglect to haul in the slack rope before putting the air-winch in motion. Brundell was standing on the slack rope when putting on the air to the winch, and it must be assumed that the rope encircled his leg and carried him round the drum. Fortunately, the foreman was close at hand to turn off the air from the winch, and thus prevented what would, doubtless, have been a fatal accident, instead of a compound fracture of the leg. No blame whatever could be laid against the management of the mine, as with ordinary care and commonsense in working the company's appliances accidents would be averted. The company do not permit new hands to work the air-winch until the mechanical working is fully explained and mastered. Brundell was competent to work the air-winch, and the inference to be drawn is that, in the hurry to leave work after the night-shift, he forgot to take the precaution to wind up the slack rope before putting on the air and placing the winch in motion: hence the accident. As a precaution against accidents of a similar kind, it is suggested that a partition be put up from the floor of the tunnel, 3 ft. or 4 ft. high, on the side of the winch where the brake and handle are placed for regulating the motive-power. This would, under any circumstances, be a protection in case of neglect of the ordinary care required.

THE Bill introduced by the Hon. the Minister of Mines for the consolidation of the various Mining Acts will be held over till next session.

"For a considerable time past depression has ruled in the New Zealand market," remarks the London *Mining Journal* of 23rd October. "Business has been on a most restricted scale, and the shares of most of the companies that twelve months ago were great favourites have been on the down grade, the prices reaching a very low level indeed. In the absence of this activity, and with little prospect of an early improvement, investors in New Zealand companies have been extremely anxious as to the fate of the companies in which they have invested their capital. We have from time to time, however, attempted to cheer them up by informing them that though the market was depressed the mines in the colony were progressing very satisfactorily, though somewhat slowly, and that the market prices of the shares was no evidence at all of the value and prospects of the individual properties. Lately, however, the market has exhibited more signs of vitality than has been apparent for some months. This has been due principally to encouraging news from one or two of the mines. It should receive further encouragement from the report of the Waitekauri Gold-mining Company, which the directors have issued during the week. This report cannot be considered as other than satisfactory. During the twelve months covered by the report 15,165 tons of dry ore were treated, the bullion from which realised £41,014, the net profit for the year amounting to £16,702 13s. 4d. Out of this a couple of dividends have been paid, amounting in all to 2s. per share, leaving £2,139 to be carried forward. The prospects, judging from the superintendent's report, are very encouraging. The ore in sight is considerably more than at the beginning of the financial year."

The following is Captain Argall's report of the boring operations in the Kapanga Mine, Coromandel, for the month ending 16th October: "During the month we have bored a further distance of 50 ft., making a total of 225 ft. below the bottom of Larnach's shaft. The rock penetrated is andesitic gold-bearing, according to the assay result from a portion of the "core," which is regularly stratified volcanic rocks, consisting of alternations of breccia and tufaceous sandstone, interlocated at intervals with dioritic rock. As stated in a former report, the country is now and then very much broken; and it is only when we get good hard rock that satisfactory progress can be made, the loose reefy matter being a great impediment. We are just now passing through some of this class, which in due course will be assayed. I may give it as my opinion that the country-rock on the whole is not adapted for the diamond-drill, as it is too patchy. If it were good solid rock, we could get through from 30 ft. to 40 ft. a week, but as it is we get 60 ft. or 70 ft. of solid rock, and then a stretch of loose rock and reefy matter, which causes trouble and annoyance. However, our patience is not quite exhausted, and we will do our best to carry the operation through."

A report has been received of the circumstances attending the fatal accident at Lankey's Creek, Reefton, by which a miner named Philip Murphy, aged sixty years, lost his life. His mate, Jeremiah J. Murphy (who was not a relative), was employed on the road, leaving deceased at work on the claim. They had only started on the ground a fortnight previous to the accident, and it has since been abandoned, having been worked out. On the day of the accident deceased had been engaged scraping out some washdirt from beneath a large granite boulder lying on the edge of the creek. A week previously a shot, containing seven plugs of dynamite, was put into the stone to break off a long projecting arm; a portion which the shot had not broken off was left shattered, and it is probable that, on holing through underneath the stone to the edge of the creek, the large boulder slightly moved, and in consequence the broken point fell off close to a prop that now stands to the stone, crushing the deceased to the ground, inflicting serious injuries on the head, and breaking one of his legs. The stone would weigh about 3 cwt., and fell 4 ft.

In accordance with a recommendation from the Buller County Council, a subsidy has been granted to enable Berry and party to prospect for three months between the Little Wanganui and the Mokihinui, which is reported as a promising locality for alluvial gold and quartz reefs. A subsidy has also been granted to Newton and party for their prospecting shaft at Bald Hill Terrace, Caledonian Lead. The first shaft put down by this party bottomed at 100 ft.; the second, which went through very wet ground, at 45 ft.; and the third at a depth of 102 ft., but, unfortunately, without obtaining profitable results, and as the whole of the shafts were close-timbered from top to bottom it has been a very expensive work. The party now intend to drive on the bottom, as far as their funds will permit, as it is considered that a lead of payable ground is likely to be met with somewhere in this locality.

In moving the second reading of the Mining Companies Acts Amendment Bill (a summary of which appeared in the October number of the *Record*) the Hon. Mr. Cadman, Minister of Mines, said that it was only a short Bill, and did not require much explanation. It proposed to make certain amendments in the existing Act, some unimportant, and one or two of an important character. Section 2 of the Bill was an amalgamation of existing sections of the Mining Act—which more properly belonged to a Mining Companies Act—with another section of the present Mining Companies Act, and virtually put all matters relating to mining companies together in the Mining Companies Act. Section 4 of this Bill virtually made section 59 of the principal Act more intelligible. Section 5 dealt with the question of forfeited shares. In the Auckland District especially there was this trouble, because shareholders and even directors in no-liability companies allowed calls to go by default, knowing that the shares would have to be sold by auction later on: thus, if a sixpenny call were made it was allowed to go by default, and they went to the auction-room and bought them for 1d. or 2d. per share, thereby pocketing the difference and entailing heavier calls later on to those shareholders who were honest enough to pay the amount in full of all calls as originally struck. By section 7 provision was made for issuing scrip certificates to all mining companies in a manner similar to banks, insurance, and other companies of a kindred nature. The other portions of the Bill dealt with minor matters. Section 8 made provision which had been asked for by many companies themselves. Under the present law they had to print their half-yearly balance-sheet, which they complained entailed unnecessary expense, as they only required one copy for the Registrar of Supreme Court. This would enable them to forward manuscript or type-written copies at their discretion. Section 9 made provision for paying the Deputy Official Assignee. At present Official Assignees, being Government officers, could not make a charge for winding-up mining companies; but their deputies in country places got no salaries, only receiving fees. The present law prohibited this, owing to an oversight in the original Act. This omission clause 9 now remedied.

In many parts of the colony the so-called "worked-out mines" are attracting attention. The history of one of these mines, situated near Cromwell, in Otago, is thus sketched by the correspondent of the *Otago Witness:* "The property of the Alta Gold-mining Company is not a new discovery, but was worked some twenty-five years or so ago and abandoned. On looking at the work done at the mine, and on hearing that nearly £3,000 had been expended on the surface, one comes to the conclusion that twenty-five years ago people spent thousands on a mine and threw it up if the first crushing was not a very good one. The property lies about three miles east of the Cromwell Company's mine at Bendigo, and is situated in a belt of reef country that once contained a lot of claims—the Rise and Shine, Come in Time, Eureka, and others too numerous to mention. All around one sees signs of former activity, but at present the field is deserted. Several batteries were erected, tramways built, water-races cut, and surface-work done on a lavish scale; then a couple of crushings were made. The results did not come up to the high expectations of the shareholders, a panic ensued, the companies had insufficient capital, and what might under careful management have been good properties were ruined. This seems to have been the history of the various claims in the neighbourhood of the Alta and of the quarter-of-a-century-ago Alta itself: boom, extravagance, and 'bust'! The property of the present Alta Company consists of a 50-acre prospecting claim. The main lode, which varies from 4 ft. or 5 ft. to about 2½ ft. in width, runs nearly due east and west, a point or two to south of west. The lode dips to the north, but not at a very great angle. The stone is of a nice character, and is similar in appearance to that of the Cromwell Mine. The old workings consist of an open stope about 30 yards long, and perhaps 20 ft. deep at the deep end; at the top end of the stope is a tunnel, which, owing to the recent rain, was full of water at the time of my visit, and not explorable; and a few shafts of 10 ft. or 20 ft. in depth straggling along the line of reef for 100 yards or so. There is also a second lode parallel to the first, and about 20 yards or so south of the main lode; and there are indications of a third between the two. The reef is there, and there is no difficulty in tracing it for a considerable distance. The old workings are simply surface scratchings, and one wonders at a company spending thousands and then throwing up a property without giving it at least a decent trial. The present company intend to sink a shaft 50 ft. or 60 ft., perhaps more, on one of the lines, and then put in a crosscut to intersect the centre one, and if the prospects at that depth are as satisfactory as they are at and near the surface they will take steps to develop the property fully. Eleven grains of gold were got from 8 lb. of stone crushed in a mortar, so that the stone carries gold right enough. The lode has a large body of stone, and is so situated as to be easily worked, and I was told that half an ounce to the ton would pay handsomely. The stone from the Eureka, one of the mines formerly worked in the Alta district, showed gold freely, but, owing to the quantity of pyrites, it could not be saved. With the new processes now in operation, this mine should be a perfect bonanza, unless the expense of the process would be so much as to swallow up everything. Seeing a large tract of country like that in which the Alta is situated full of reefs bearing gold in payable quantities—that is, if the mines were cheaply worked—one is led to think that the Government might do worse than build a battery to crush at a fair price for the public. I daresay if such a battery was built in the Rise and Shine country many miners could make a very comfortable living out of reefs which have ruined companies that went to work extravagantly and recklessly, and which it would require a very rich reef to keep going."

A REPORT on the accident which occurred at the Waihi Mine states that, on the 6th November, John Hatton and his mate were sinking a winze to meet a rise which was being put up from No. 2 level, and were on the verge of holing through, as the men working in the rise could speak to them, and *vice versâ*. The men in the rise bored two holes, and were going to fire, when Hatton told them to wait, and he would fire a hole which they had bored in the winze at the same time. After they had set fire to the fuse, Hatton went out by the No. 1 level, his mate going in, so as to prevent any person passing the top of the winze until the shot went off. Immediately after two shots were fired, Hatton rushed back to the top, and was in the act of looking down the winze, which was only 3 ft. deep, when the shot which he put in went off, with the result that he received the contents of it, his eye being knocked out, and his face, arm, and body considerably bruised. Hatton stated that he was not aware the men in the rise were going to fire two shots, but Eckland, the miner who fired them, was positive that he distinctly told Hatton he was firing two shots, and inquiries made showed that Hatton was entirely to blame in rushing back to the top of the winze within two minutes after setting fire to the fuse.

PROSPECTING licenses have been granted to J. Richmond, of Masterton, to search for minerals over all Crown lands in the Tararua Ranges, subject to the condition that every precaution be taken by the licensee to prevent the destruction of the bush on the forest reserve by fire; to H. Wilcox, R. Chase, W. A. Teague, G. Blake, and J. McLeod, Taupo district; to Jas. Barry, Wm. Barry, and John Barry, on Sections 52, 53, 57, Block V., Lindhurst Hundred, Southland; to Edward McMillan and Wm. Taylor, Takitimo district, Southland; to Caleb Froggatt and Wm. Taylor, Te Anau district; to George H. H. Oatway, near Boat Harbour, Coast district, Otago; and to James Enright, Naseby (lignite).

AN examination of candidates for certificates as first- and second-class mine-managers and battery-superintendents under "The Mining Act, 1891," and Amendment Act, 1894, and first- and second-class mine-managers under "The Coal-mines Act, 1891," will be held on Tuesday, 25th January, 1898, and three following days. Applications, accompanied by necessary certificate and fee of £1, must be addressed to "The Secretary of the Board of Examiners under the Mining Act and Coal-mines Act, Wellington," and must be received by the 4th January, or they will not be dealt with until the following examinations.

"THE way the Cromwell Mine has been bungled by the London shareholders is the cause of considerable comment by the colonial shareholders," writes the Dunedin correspondent of the *Dunstan Times*. "Some months ago £5,000 was sent out from London to help to work the mine. A manager was appointed and a manager's house was erected, and many other needless expenses were entailed, with the result that in a few months the £5,000 was gone, and the London shareholder was asked to put his hand in his pocket and subscribe more. John Bull objected, and the mine was let on tribute, with the result that over £3,200 worth of gold was extracted from the mine within four months by tributers. Verily, this is a nice state of things. There is a screw loose somewhere."

A VALUABLE contribution to the chemistry of the cyanide process, by Mr. William Skey, Government Analyst, has been presented to both Houses of Parliament. A summary of Mr. Skey's investigations was given in the October number of the *Record*, and has been copied into several of the mining and scientific journals in Australia and California.

An association of ten settlers at Ashurst, near the Manawatu Gorge, have promised to subscribe £30 towards prospecting the ranges beyond Rangawhai, in the Oroua country, for gold and other minerals. A man named Gustav M. Thureau started on the 28th October to prospect the country on behalf of the association, who have applied for assistance, and been informed that 10s. a week each to parties of two or three men sent out prospecting will be granted on the usual conditions.

An inquiry having been recently received from a metal merchant in Australia, on behalf of one of the largest consumers of chrome iron-ore in Europe, for particulars of deposits which are known to exist in New Zealand, but particularly so in the Aniseed Valley, Nelson, the following particulars were furnished to the Under-Secretary of the Department by Mr. Alexander McKay, Government Geologist: — "Chrome ore (chromate of iron) occurs in New Zealand chiefly in association with the magnesian rocks of the Dun Mountain mineral belt, in the Nelson Provincial District. Associated with rocks of the same age and character, it also occurs in the mountainous district of North-west Otago and the southern part of Westland. In both localities the formation is of Devonian age. In the Nelson District chrome ore has been traced from D'Urville Island, in the north, to the gorge of the Wairoa River, about half-way along the total length of the mineral belt. The chief developments of ore are found between the Upper Maitai Valley and the Lea River, a distance along the mineral belt of twelve miles. The ore occurs in elliptic masses, usually at a given distance from the north-west margin of the mineral belt. Some of these deposits are of considerable size, and the total of the ore exported from Nelson was mainly from one outcrop near Dun Mountain, supplemented by a lesser quantity from Little Ben Nevis. Over this part the whole of the outcrops of value are held under lease, or the rights to mine have otherwise been acquired. The region lying between the Upper Wairoa and Tophouse, known as the 'Red Hills,' is composed, over a length of seven miles and a breadth of three miles, of olivine and serpentine rocks. This has not been explored or prospected, yet is a promising field for the occurrence of chrome or copper minerals. The Dun Mountain mineral belt south of the Maitai Valley (where the chief mineral wealth lies) is rugged, mountainous country, and the ore-deposits not being as continuous lodes, the position and amount of ore in each particular outcrop has to be considered in relation to the cost of road-making and carriage to the Port of Nelson. From the Red Hill area the distance would be fifteen miles to the railway at Motueka Crossing; to Blenheim, the distance would be more than forty miles. In the southern area, extending from the neighbourhood of Jackson's Bay along the Chrome and Red Mountain Ranges, and the mountains to the south as far as the source of the Greenstone River, there is a likelihood of the occurrence of chrome in quantity; but the character of the country is very rugged, and great cost in road-making would have to be incurred to reach and bring to the seaboard any ores that might be found."

Mr. John Ewing, of St. Bathan's, in making an application for boring-rods and -tubes to prospect Anderson's Flat, about four miles below Roxburgh, stated that he had got the loan of a serviceable set of rods and tubes from Vincent County Council, but the deposit bored through was very hard on tubes, and stronger ones than those he was using (4 in. inside diameter and ¼ in. thick) would be required. "The stuff sunk through is Clutha River gravel, very clean and full of round hard quartz stones of all sizes, with an occasional boulder of hard schist with quartz laminations." Mr. Ewing had been informed the Public Works Department had tubes such as he required out of use at Palmerston North; but, on that department being applied to, it was found that there were only rods at Palmerston North, but that there were some tubes in Wellington, though not nearly so large as Mr. Ewing requires, being only 1⅛ in. inside diameter and ⅜ in. thick. Mr. Ewing states that strong tubes are necessary in all prospecting for alluvial gold.

The *Australian Mining Standard* furnishes the following particulars relative to the visit of Mr. R. Murray and Dr. Storer to this colony: "Mr. Reginald Murray, ex-Government Geologist (Victoria), and Dr. John Storer, left Melbourne for New Zealand on Friday last. They have been commissioned by a Melbourne syndicate to inspect a copper-mine near Nelson. This property was abandoned in 1888, owing to the low price of copper. The report furnished by Sir Jas. Hector at that period showed that the ore (firsts) returned from smelting 37 per cent. (seconds) 16 per cent. This ore, it is stated, carried 5 dwt. gold to the ton. The improved methods now in use should make this property a very valuable one on a much smaller return. The area is over 4,000 acres, and the report of these well-known experts will be awaited with much interest."

Professor Black recently gave an exhibition at the Colonial Laboratory, Wellington, of his permanganate gold-recovery process before the Hon. the Minister of Mines, the Goldfields Committee, the Inspecting Engineer, the Government Geologist, the Government Analyst, and some Press representatives. He explained that the process was very cheap and very simple, but that ores treated by the permanganate solution would first have to be calcined, and the expense of this would vary considerably, according to the locality, from 5s. up to £3, but the expense of the permanganate would not exceed 5s. or 6s. per ton. He exhibited a gold ingot recovered by the process from Mount Morgan ore, and said the process would be effective in the case of refractory ores where cyanide could not be used. He stated that arrangements had been made with the Monowai Company at the Thames to treat the ores from their mine.

The Wakatipu correspondent of the *Otago Witness*, who has contributed a series of interesting articles to that journal on Klondyke, makes the following comparison : "Taking the Otago Goldfields again as an illustration, and drawing a line from the Invincible, or, as it is now called, the Rees Valley, lode to the Achilles Mine, thence to Gallant Tipperary, from here to the Macetown reefs, thence to Bendigo Gully near Cromwell, across the Maniototo Goldfield to Nenthorn, we have a nearly straight line indicating the trend of all the principal quartz lodes of the Otago Goldfields, and south of which same line, flowing in a somewhat oblique direction towards the South Pole, in the same manner as in Canada towards the North Pole, run all the gold-bearing rivers and creeks, with their terraces and flats, which go to make up the auriferous wealth of the two mining districts at two of the ends of the world. Attention to such leading and well-observed facts is of the greatest assistance to the prospector."

Samples of telluride ores have been obtained by the Hon. the Minister of Mines from the Western Australian Government, and have been forwarded to the different Schools of Mines. Rocks similar to those which contain tellurides exist over an extensive area of the West Coast, extending from the source of the Grey River to as far south as the junction of Westland and Otago, and also over a large portion of Otago.

A prospecting subsidy of £19 10s. has been authorised for Spence and party for prospecting at Rough and Tumble Creek and at Mokihinui.

Mr. James Park's work, "The Cyanide Process of Gold Extraction," has been in such demand that a third edition has already become necessary. Mr. Park's work was the first textbook published on the cyanide process, and it is now used as the authorised textbook on the subject in all Schools of Mines and Universities in New Zealand and Australia. The chief sale for the work has been in Australia, America, and South Africa, and appreciative reviews have been published in many of the mining and scientific journals in America, South Africa, and Great Britain. It has been invariably the custom in New Zealand for authors of scientific works, owing to the necessarily limited number of readers, to obtain assistance from the Government for their publications; but Mr. Park had sufficient confidence in the work to publish it himself, with the result that it has been financially and otherwise a success, while it has been the means of making the author more widely known, and indirectly the Thames School of Mines, of which he was director for some years The work is published by Messrs. Chamtaloup and Cooper, Auckland; the typography and maps having been executed in the jobbing department of the *Herald*.

Illustrations of the workings at the Waihi Mine and of the celebrated Martha Reef are given with this issue. The photograph of the Martha Reef was taken some months ago in the workings at the No. 2 level, 300 ft. west of No. 1 shaft, and 380 ft. from the surface, the face of the second stope being 30 ft. wide. Some of the financial papers, which have allowed correspondents to decry New Zealand mining investments, may be interested in learning that this mine, which in its early stages of development was abandoned more than once and pronounced valueless, though the original discoverers had no lack of faith in its golden treasures, has now paid nearly a quarter of a million sterling in dividends.

The gold export from the Port of Auckland for the month of November was the highest recorded for 1897, being 14,314 oz., value £53,654, to which the Komata Reefs made a contribution of £3,300 from 1,000 tons crushed at their newly-erected battery; and 19,751 oz. of silver, value £2,254. The month of June comes next with 13,241 oz. of gold, value £50,637; and 19,086 oz. of silver, value £2,267.

A dividend of 2s. per share has been declared by the Waihi Gold-mining Company (Limited). This on 160,000 shares amounts to £16,000, making a total of £244,500.

From photo. by Potter, Auckland.

Martha Reef, Waihi.

THE newly-appointed Chief Inspector of Mines in New South Wales, Mr. Atkinson, supports the opinion of his predecessor, Mr. Dixon, with regard to the utility of safety-catches of coal-mine cages. The Minister for Mines, Mr. Sydney Smith, some time ago requested Mr. Dixon to furnish a report as to the desirableness of insisting that "catches" should be attached to all cages used in lowering or raising persons working in coal-mines. Mr. Dixon's conclusion was that no safety-cage which could be thoroughly relied upon had been perfected. Support was given to the opinion by the finding of the Imperial Commission on Accidents in Mines, published in 1886. Mr. Smith therefore considered that the circumstances did not warrant, at that time, any alteration being made at the collieries. The matter was subsequently brought under his notice by a deputation. Mr. Smith then asked for a report from Mr. Atkinson, who had been appointed in the meantime, and who has had large English experience. Mr. Atkinson, in a voluminous report, mentioned that there are only thirty-three shafts in New South Wales in connection with the coal-mines where men and boys are regularly sent up and down. In most of these either wire ropes or flat-bottomed rail guides are used as conductors, and in these cases it would be impossible to apply any safety-catch to be of any use. In England at present there are very few safety-cages in use, the consensus of opinion amongst mining engineers and colliery managers being much in favour of a careful examination of ropes, in order to avoid accidents by ropes breaking. Mr. Atkinson disagrees with the use of the cages, and thinks that ample power is provided in the Coal Mines Act to secure safety.—*Australian Mining Standard.*

A PETITION has been received from about a hundred miners and other persons urging the proclamation of the Wangapeka. The river will be proclaimed a watercourse for the deposit of tailings and mining *débris* as soon as the parties interested in mining on private lands have arranged to satisfy the claims for compensation.

A COAL-SCREEN of novel design, which has given very satisfactory results at the Coal Valley Mine, in Iowa, U.S., has nine shafts, carrying wheels with corrugated surfaces, and cast-iron washers to separate the wheels so as to make apertures of ½ in. to 1½ in. in width. The screen does not require much space, being only 9 ft. square, and does not require as much pitch as bar screens.

MR. R. VON GEMBER, managing director of the General Exploration Company, Berlin, who came to the colony for the purpose of inspecting the important works carried out by Mr. Dencker, the company's engineer, at Fairdown and Addison's Flat, near Westport (a report of which appeared in the October number of the *Record*), is well satisfied with the way in which everything has been carried out, though fully convinced that it is only by systematic and economical working that a return can be obtained for the large amount of capital already expended. Mr. von Gember will shortly return to Berlin.

"WHETHER the English investor turns his attention to Victoria or not will not disturb local feeling in the slightest, except those directly concerned," writes the correspondent of the London *Mining Journal.* "The people are indifferent. Many of them look with grave doubt on the large capitalisation of some English companies in comparison with the amount actually set aside for working-expenses, and wonder why dividends are expected under such circumstances. . . . As a rule, if the owners of mining propositions sent from here to London cared to speak out, it would be found that they receive only a very small proportion of cash and shares for their properties."

THE *Mining and Scientific Press*, in referring to the necessity for amending the U.S. federal mining laws, states: "Amid the multitude of necessary reforms stands most prominently the necessity of radical change in the United States statutes governing the apex law and the question of side-lines. As the question now stands, the owner of a mining claim may follow and develop any lode having its apex or outcrop within the surface-lines of his location, regardless of where such lode may extend in its downward course. This paper has all along held that for this law should be substituted one providing for square locations confining the rights of claim-owners within their surface-boundaries, and thus make our mining laws conform in this regard with the rest of civilisation, and bring our statutes into harmony with our practice as regards all other land-claims, the owners of which have no right to go outside of their surface-lines."

A DEFINITE idea of the present standing of alchemy in America is given by Dr. H. C. Bolton in the London *Chemical News.* Two claims to success in creating gold are deemed worthy of mention on account of the boldness, persistence, and apparent scientific basis with which they have been urged. The claim of Dr. G. H. Emmons was first advanced in August, 1896, and in July of this year it was stated that nearly one thousand dollars' worth of an alloy of gold and silver, which had been produced from Mexican dollars, had been sold to the United States assay office, the profit on such manufacture being at least 3 dollars per ounce. It was predicted that the production would reach 50,000 oz. within a year. Dr. Emmons affirms that his work had its origin in an investigation of nickel steel in 1892, when evidence of a new substance appeared, and, acting on a suggestion from Mr. Carey Lea's work on the allopathic forms of silver, he made a more minute subdivision of silver than Mr. Lea obtained, and compressed this in a new apparatus of great power. The result is a substance—called "argentaurum"—with greater density than silver and the appearance and properties of ordinary gold. The chief source of expense, in the words of Dr. Emmons, "is the time required for bringing about the desired molecular changes." The second process for transmutation is claimed by Mr. Edward C. Brice, of Chicago, whose operations seem to have been begun in New York about three years ago, and to have continued with numerous victims—although his Chicago plant is still declared a financial success. A patent was applied for last May, and twice refused. The application being pressed, an elaborate test of the process was made by the patent office, with no results except partially to recover the small percentage of gold contained in commercial antimony.

IT is in contemplation to open the Industrial and Mining Exhibition in Auckland on the 1st December, 1898, and the Government have decided to give a grant of £500, the amount to be apportioned between the Department of Industries and Commerce and the Department of Mines. It is proposed, in addition to the General Industries Court, to erect a large hall for gold-mining exhibits only, and it is expected that all the mining centres throughout the colony will contribute exhibits.

REPEATED applications having been made for the Barrier Reserve on the foreshore at Coromandel, and reported on by the Inspector of Mines, it has been arranged that, as soon as his other engagements permit, the Inspecting Engineer will visit the locality and confer with the Warden, Inspector of Mines, and the parties interested, with a view to an equitable settlement of the matter.

THE Blue Spur and Gabriel's Gully Consolidated Company (Limited), Otago, have declared an interim dividend of 4 per cent. on the preference shares.

A GRANT of £15 has been approved for the purchase of chemicals, &c., for the Nelson School of Mines for the ensuing year. The honorary director of the school, Mr. W. F. Worley, states that there has not been so much assay work done this year, but there are more lads now in the blowpipe class than on any previous occasion.

UNDER the heading of "Important Mining Judgments" will be found a decision lately given by Mr. Warden McCarthy at Alexandra. It has an important bearing on dredging as well as on the mining industry generally. There was no appeal from the Warden's decision, though it is stated that the complainant company consulted counsel in Dunedin in reference to it.

W. S. WILLIAMS is superintendent for the Monte Cristo Placer Mining Company of Kansas City. Recently he entered into a contract with M. Harrold, the Pennsylvania well-expert, to sink a tubular well for the purpose of supplying water to wash the rich placer deposits owned by this company in "Old-Timer" gulch, near Golden. They sought higher ground, and leased from the Las Vegans the privilege of locating the well on their property. At the depth of 350 ft., it was noticed that the drill was bringing up pure white quartz carrying free gold. The stuff was panned, and grains of the yellow stuff as large as an average grain of wheat were revealed. The miners of the camp went wild. The well was being sunk in virgin ground; no mining shaft in the vicinity had ever attained one-fifth of that depth, and it was recognised that a great find had been made. Yet nobody, not even the most enthusiastic, was prepared for what came after. As the well tools pounded away, the white quartz-ledge was shown to be thicker and thicker, and now, after reaching a depth of 500 ft., it has been demonstrated that underlying the surface-ground owned by these Las Vegans there is a free gold-deposit of at least 50 ft., the whole of which prospects one thousand dollars to the ton and upward. Within this extraordinary deposit has been encountered a flowing underground river—its roar is akin to a small Niagara—which is good for the placer miners, but tough on the lode-miners, who must sink a shaft, or several of them, to get at these newly-found riches. It will probably cost, considering the quantity of water in sight, 20,000 dollars to sink a shaft 400 ft. there, but nobody questions the ability of Manzanares *et al.* to go after the great riches which have thus been shown to exist beneath the surface of their south Santa Fe. county mining claims.—*Las Vegas Optic* (New Mexico).

A BUILDING for a school of mines and library is in course of erection at Miller's Flat, Otago, Mr. Robert France's tender at £347 10s. having been accepted for the work. The contribution of the Mines Department towards the school of mines is £150.

THE following tenders have been accepted by the Mines Department, Victoria, for engines for the prospecting batteries lately set up in the mountainous districts in that colony: R. Hornsby and Sons, patent safety horizontal oil-engine for battery at Creswick, £155; R. Hornsby and Sons, four-horse power portable engine for battery at Tangil, £167 10s.; J. Danks and Son, four-horse power portable engine for battery at Clifton Creek, £175; Welch, Perrin, and Company, four-horse power portable engine for battery at Orbost, £175.

AT the University of California, Berkeley, California, Professor O'Neil, of the Department of Chemistry, in the course of a lecture on "The Transmutation of Metals," declared that the idea of making gold from silver and other metals is not an unreasonable one. The professor believes that the old alchemists who searched for a means of manufacturing gold did not waste their time, as the science of chemistry is based upon results they produced. He says "there is ground for thinking that gold can be made out of silver or other metals," and that it is not "scientifically improbable."

IN mining districts the question of scale in steam-boilers is often a very serious one, owing to the large amount of mineral salts in the water available for use. The sulphates and carbonates of lime and magnesia predominate. The sulphates are most to be dreaded, as, in addition to their other bad qualities, they act upon the iron, as can be seen by chipping off a piece of sulphate scale, when a layer of iron-rust will be found on the under-side. Scale is such a very bad conductor of heat that with a layer of it ⅜ in. thick twice as much heat must be applied to the boiler in order to produce the same amount of steam as if the boiler were clean. This waste of fuel is not the greatest loss. In a clean boiler the heat applied to the shell and the flues is instantly communicated to the water, and water and iron remain at about the same temperature. When, however, the flues and plates are covered with scale, so much heat has to be applied to them in order to overcome the insulation that they become injured and burned. Iron, when heated to 600 deg. and upwards, oxidizes very rapidly, and becomes granular and brittle. It is not surprising, therefore, that all the authorities agree upon scale as the cause of many of the boiler explosions. Among the many remedies proposed for this trouble a recent one is to introduce kerosene-oil into boilers, drop by drop, and this is becoming very popular. The best known appliance for this purpose is that made by the Detroit Lubricator Company, of Detroit, Michigan. They have sold and are selling large numbers of them in all parts of the country, and users report satisfactory results. The fact that they are sold to large manufacturing and mining plants, water-works, and electric-light stations, where, as a rule, men of superior intelligence are in charge, is in itself a strong evidence of merit. The cheapness of the remedy and the further fact that kerosene leaves no residue in the boiler, and that it cannot injure iron, are additional points in its favour. All interested in the scale difficulty will do well to investigate this appliance.—*Engineering and Mining Journal.*

IN an article on the Bendigo District Gold-mines Company (a company floated in London, which has gone into voluntary liquidation), the London *Mining Journal* draws attention to the fact that "the company had five London directors, whose qualification, according to 'Skinner's Manual for 1897,' was one share. On the Melbourne board it was equally splendiferous in advisers. . . . With five directors and a secretary in London, three advisers, and a firm of legal managers at Melbourne, on a working capital of £16,565, with four claims to develop and equip with machinery, who in their sane senses would for a moment think that the fate of the Bendigo District Company would be otherwise than it is?"

THE rapid progress along all scientific lines in Japan, combined with frequent earthquakes in that country, which have proved very destructive to gas-pipes, has, according to the *Electrical World*, resulted in numerous electrical installations for lighting. Hardly any large town in the more accessible parts of the country is without a station, and there is an increasing demand for dynamos, motors, and other apparatus. The Japanese have already begun the manufacture of dynamos. The Mitsui-Bussan Company, in Tokyo, has, remarks the *Electrical World*, already turned out some very creditable types of two-phase alternators. The most complete plant in Japan, and one that would be creditable to any city, is that of the Kioto City Electric Works, in the town of that name.

THE GOLD-MINING INDUSTRY IN NEW ZEALAND.

THE following is an approximate return of the areas held under the Mining Act, annual rental, number of men employed and average earnings, number of registered companies, value of gold produced since registration, and amount of capital actually paid up, and quantity and value of gold exported from 1857 to 31st March, 1897:—

Area of Special Claims, Licensed Holdings, &c., 31st March, 1897.	Annual Rental.	Number of Men Employed.	Average Earnings of Men Employed	Number of Registered Mining Companies 31st December, 1896.	Value of Gold produced since Registration to 31st December, 1896.	Total Amount of Capital actually paid up to 31st December, 1896.	Quantity and Value of Gold Exported from 1857 to 31st March, 1897.	
							Quantity.	Value.
Acres.	£		£		£	£	Oz.	£
133,282	53,650	14,889*	68	461	2,334,617	1,559,226	13,383,528	52,668,246

* Made up of 12,900 Europeans and 1,989 Chinese.

BATTERY AND GOLD RETURNS.

HAURAKI GOLDFIELDS.

Battery Returns for November, 1897.

Name of Company, Mine, or Battery.	Locality of Mine.	Ore or Tailings.	Number of Tons crushed or treated.		Yield of Gold or Bullion.			Value.		
			Tons.	Lb.	Oz.	dwt.	gr.	£	s.	d
Tararu Creek	Thames	Tailings	200	..	..			110	0	5
Waiotahi	"	Ore	125	..	162	10	0	..		
May Queen Extended	"	"	133	60	171	8	0	..		
Kuranui-Caledonian	"	"	150	..	19	3	0	51	9	4
New Alburnia	"	"	200	..	107	18	0	288	3	6
Claremont	"	"	..	12	10	10	0	..		
Hauraki-Anchor	"	"	16	..	4	5	0	..		
School of Mines	"	"	12	2,101	38	14	0	..		
Judd's Tailings Plant	"	Tailings	401	..	94	0	0	..		
Mahara-Royal	"	Ore	205	..	146	2	0	444	7	9
Sheridan	"	"	373	..	10	16	0	..		
New Zealand Crown Mines	Karangahake	"	1,964	..	2,010	15	0	4,232	7	3
Woodstock	"	"	1,020	..	3,157	4	0	..		
New Zealand Talisman*	"	"	603		1,872	17	0	1,809	0	0
"	"	Tailings	16							
Waihi	Waihi	Ore	2,300	..	11,169	0	0	11,352	13	4
Waihi-Silverton Extended	"	"	1,250	..	856	0	0	1,694	4	0
Waitekauri	Waitekauri	"	1,945	..	3,545	0	0	4,077	2	6
Grace Darling	"	"	30	..	27	0	0	..		
Komata Reefs	Komata	"	1,000	..	..			3,300	0	0
Hauraki	Coromandel	"	280	175	552	0	0	..		
Scotty's-Hauraki	"	"	20	340	121	0	0	..		
Hauraki North	"	"	74	336	38	2	0	..		
Kapanga	"	"	68	98	175	19	0	..		
Royal Oak of Hauraki	"	"	17	1,401	1,699	5	0	4,262	5	8
Mariposa	"	"	465		141	8	0	..		
"	"	Tailings	360							
Kapai-Vermont	"	Ore	380	..	174	0	0	..		
Fraser and Sons	Auckland	"	7	..	170	14	0	..		

WEST COAST AND OTAGO GOLDFIELDS.

Battery Returns for November, 1897.

Name of Company, Mine, or Battery.	Locality of Mine.	Quartz or Alluvial.	Number of Tons crushed or treated.	Yield of Amalgam.			Yield of Retorted Gold.			Value.		
				Oz.	dwt.	gr.	Oz.	dwt.	gr.	£	s.	d.
NELSON AND WESTLAND.												
Keep-it-Dark	Reefton	Quartz	338	..			98	10	0	..		
Big River	"	"	310	..			130	0	0	..		
Sir Francis Drake	"	"	170	..			51	10	0	..		
Alpine Extended	Lyell	"	348	290	10	0*	..			..		
OTAGO.												
Achilles Goldfields	Bullendale	"	588	364	0	0	178	0	0	630	0	0
Glenrock Consolidated	Macetown	"	460	1,053	0	0	377	13	0	..		
Morning Star †	Preservation Inlet	"	..	874	14	0	269	5	0	..		
Round Hill	Round Hill, Longwood district	Alluvial	..	..			161	19	12	..		

* From top plates only. † Three weeks—28th October to 18th November.

SPECIAL CLAIMS AND LICENSED HOLDINGS.

List of Special Claims and Licensed Holdings issued during October, 1897; also Number of Forfeitures, Surrenders, and Transfers during same Month.

District.	Number of Special Claims and Licensed Holdings granted.	Area.	Annual Rent.		Number of Forfeitures or Surrenders.	Number of Transfers.
			First Year.	Subsequent Years.		
		A. R. P.	£ s. d.	£ s. d.		
Whangarei	..	..	..	..	..	..
Coromandel	5	164 3 20	36 19 0	73 14 0	23	3
Thames	..	..	..	..	33	7
Te Puke*	8	729 0 0	..	..	..	..
Lyell	..	..	..	..	..	4
Westport	2	199 0 0	49 15 0	99 10 0	..	..
Charleston	2	90 2 10	23 0 0	46 0 0	..	..
Reefton	1	27 0 30	7 0 0	14 0 0	..	..
Ahaura	..	..	..	..	..	3
Kumara	..	..	..	..	..	1
Stafford and Goldsborough	..	..	..	..	..	1
Hokitika	..	..	..	..	..	..
Naseby	6	189 3 10	48 0 0	96 0 0	1	1
Clyde, Blacks, Alexandra, and Roxburgh	13	1,060 1 14	265 15 0	531 10 0	2	1
Cromwell	3	182 0 39	45 15 0	91 10 0	1	1
Dunedin	2	78 2 0	19 15 0	39 10 0	..	..
Lawrence	2	130 2 3	33 0 0	66 0 0	1	5
Waikaia	2	47 1 20	12 5 0	24 10 0	2	..
Totals	46	2,899 1 26	541 4 0	1,082 4 0	63	27

* Private Land.

OTAGO DREDGING RETURNS.

The following returns for the month of November have been furnished by Mr. John Gage, secretary of the Dunedin Stockbrokers' Association:—

Name of Company or Dredge.	Locality of Operations.	Yield of Gold.
		Oz. dwt. gr.
Enterprise	Alexandra	88 4 9
Otago	Miller's Flat	105 11 0
Golden Treasure	Miller's Flat	64 13 0
Upper Waipori	Waipori	38 14 0
Jutland Flat	Waipori	108 10 0
Golden Crown	Waikaia	27 10 0
Golden Gate	Island Block	29 13 0
Ettrick	Ettrick	18 9 0
Roxburgh Amalgamated *	Roxburgh	180 2 21

* Sluicing claim.

The Jutland Flat has declared a dividend of 6d. per share.

The flotation of the Waimumu Gold-dredging Company (Limited) is announced, with a capital of £6,000, in 6,000 shares of £1 each, 1,000 fully paid-up shares given to the vendors; Ophir Gold-dredging Company, capital, £6,000, in 6,000 shares of £1 each.

Mr. F. Rollett, who has had a wide experience of the various goldfields of the colony, is now editor of the *Mining Standard*, Auckland. For many years past Mr. Rollett (who is perhaps better known by his *nom de plume*, "The Warrigal,") has, in the columns of the Canterbury and Auckland Press, endeavoured to impress colonists with the great possibilities of mining as a permanent industry.

"The Bendigo mines have now reached such great depths that miners only work with difficulty, and six hours' labour is all that they can do underground in certain localities," remarks the correspondent of the London *Mining Journal*. "It is preying on their health and making old men of them at forty. Consequently the constitution of the rising generation is likely to be undermined unless some amelioration of the conditions under which their fathers work is introduced." The Victorian Government, acting on the advice of the Board appointed to inquire into the matter, have offered £1,000 to any person who can institute a cheap and effective means of ventilating mines. The conditions will be found elsewhere.

WATER-CONSERVATION IN WESTLAND.

THE following extracts give the salient points of Mr. Perham's report on water-conservation in Westland:—

Wylde's Water-race, Wainihinihi River.

According to instructions to report on the Rimu and Back Creek Water-race, and the proposals of Mr. James Wylde for purchase of his rights in the Wainihinihi River in connection with a projected race to supplement the water-supply on the Kumara Goldfields, I proceeded to Kumara and consulted with Mr. Aitken, water-race manager, on the subject.

After an examination of the plans, &c., it was not considered necessary, as the line would have to be cleared for the purpose, to make a personal examination of the ground.

Briefly, the proposed race is intended to connect with the Government dam and water-race system, and a preliminary survey has been made of the route about 154 chains in length, with a grade of 8 ft. to the mile, and it is claimed to deliver 116 sluice-heads of water for twelve hours daily. The construction of the race presents no special difficulty, with some exceptions of precipitous rock-cutting and loose sidings and the average amount of fluming. The termination of the race, however, crosses the boundary of the Waimea-Kumara Water-race Reserve, and encroaches thereon, to the extent of about 6 chains, to enable a connection with the Kawhaka Creek about three miles and a half above the main dam. This connection appears to be the only object, for there is no known auriferous ground within many miles of any portion of the race.

Quoting from a report by Mr. Aitken, "The water-rights held by Mr. Wylde would be valuable for augmenting the supply in the Waimea-Kumara water-races, but for no other purpose, and the race has been marked out with apparently that intention, and not for the purpose of bringing in an independent race to work any known auriferous ground." Again, he says, "There has been no outlay of money on the race by any one, except expenses of preliminary survey and applying for the rights." The conditions of the Act have therefore not been complied with.

The question seems to be, setting aside the point raised of legality of entrance on the reserve to form the connection, whether the water from this source is wanted now, although, perhaps, in the future the race may be of value to the district. By means of the new substantial timber bywash at the Loopline Dam, which is now nearly completed, the present level of the reservoir can be raised 18 in. at least, or even 3 ft., with safety, without adding to the embankment, by closing the sluice-doors. This additional level, spread over such a large area, will enormously add to the daily supply in dry seasons. At the time of my visit the surplus water, which can now be stored, was running over the bywash.

Mr. Aitken also has another inexpensive scheme for increasing the supply in this reservoir—costing about £1,000—by bringing in the water from a neighbouring creek which is now running to waste; and, as Mr. Wylde's proposals have now been declined, I recommend this scheme as worthy of favourable consideration, in the event of more water being immediately needed.

Looking to future requirements for opening out new claims, another race is in view which would be a more valuable addition to the present supply, as it would divert the head-waters of the Arahura-Wainihinihi into the Kawhaka watershed. No survey has, I believe, yet been made, but it is known that the saddle, over or through which it would pass from the one watershed to the other has the advantage of being 100 ft. lower than the Kawhaka saddle, through which Mr. Wylde's race would be brought.

In conclusion, I need only refer to former remarks in Otago Central reports on the necessity for investigation of existing rights held by individuals who have not complied with the conditions under which those rights were granted, and retain them greatly to the detriment of any general scheme of water-conservation, in many instances evidently for no other object than anticipating ultimate pecuniary benefit.

Kanieri Lake and Back Creek–Rimu Water-race.

Being requested to check the surveys of Messrs. McFarlane and E. A. Lord, with a view of ascertaining if the water by this proposed race from the lake would command the terrace on the left bank of the Hokitika River, as represented by the reports, I determined to run a series of barometric levels back from the lake at the race intake at Sunny Bight, by way of the road to Kanieri and Rimu Townships, to the termination or point of discharge on Seddon's Terrace, deeming that course, with an examination of the plans and sections, quite sufficient for all practical purposes, inasmuch as considerable time would be required to clean out and re-level Mr. McFarlane's line, which would really involve another survey. The levels had already been closely checked by Mr. Lord, who has large experience in the survey and construction of water-races, and proved to be practically correct.

It may here be mentioned that a previous survey had been made by Mr. J. A. Smyth, who found that the loss of fall by the circuitous route he took would prevent the water being brought to a sufficient level to work the higher ground on Seddon's Terrace. Mr. McFarlane, who came next, reduced the length and fall of the race by taking a more direct line, and using tunnels instead of following the contour of the country, and claimed to deliver the water on the terrace at an altitude sufficient to command the whole field. But, to accomplish this, a part of his scheme was the raising of the surface of the lake 11 ft., by throwing a dam or weir across the Kanieri River at the outlet from the lake. Now, clearly, to raise the level of the lake for the only purpose of gaining elevation, and taking the water from the surface would defeat the object, because the water conserved below the embankment henceforth would be useless. The lake, in my opinion, rather should be tapped at its lowest summer level, thus gaining the benefit of the 3 ft. natural rise, and then, if found necessary, the storage could be afterwards increased by raising a weir or dam. However, a few feet on the terrace either way is not of vital importance.

The total length of the race as surveyed from the lake to Handley's Dam, on Seddon's Terrace, is six miles and a half, and follows the firm line shown on the plan attached in ditching, fluming, and tunnelling to Bluebottle Terrace, and from thence across the flat and the Hokitika River to Handley's Dam in a siphon, with a total fall, including the hydraulic grade of the siphon, of 79 ft. Now, ignoring Mr. McFarlane's 11 ft. elevation, and starting at O, the lake-surface, I levelled down the road to Kanieri and across the bridge to Rimu Township, where we were joined by Mr. McKay and other miners interested in the field, and found that point 180 ft. below the lake-level. Then that 180′ − 79′ fall of race = 101′ discharge above Rimu. Thence following the road on top of Seddon's Terrace a mile and a quarter to the southward of Rimu found it 100 ft. below the lake-level. Then that 100′ − 79′ fall of race = 21′ discharge above the top of the terrace. Crossing Arch Creek at Prospector Claim, about one mile beyond, still on top of the terrace near and above the level of Handley's Dam, found it 50 ft. below the lake. Then taking first the fall of race of 79′ − 50′ = 29′ below the top of the terrace.

Many other readings were taken of course, but the three here mentioned are on the highest points of the top of the terrace, the point to be gained. There are several claims at about the same level as the last mentioned on the top of the terrace—O'Connor's, Leary and Stains's, Balkan's, &c.—all on what used to be known as Back Creek, but which is now either sluiced away or obliterated by tailings, &c.

Returning to the 29 ft. delivery below the top of the terrace near Handley's Dam, there is this point to be considered: The average depth from the surface of the known auriferous gravel drift seems from recognised authorities to be between 75 ft. and 80 ft. all along the terrace. So taking the least at 75 ft. then 75′ − 29′ = 45′ discharge above the bottom of the auriferous drift, which means, in other words, 101 ft. pressure from the head or intake of the siphon for sluicing down the upper face of the terrace; at Rimu, 231 ft. pressure to the bottom of the auriferous deposit; and at Seddon's Terrace, 151 ft. pressure, &c.

I think the above figures show that the water from the Kanieri Lake does command the terrace so far, at a fair working-pressure for sluicing, for a distance of a mile and a quarter to the southward of Rimu as far as Arch Creek on the top of the terrace, and, if the estimate of the depth of the auriferous drift from the ground-surface be correct, a considerable area of ground near the top of the terrace for another mile beyond to Handley's Dam. Beyond this point again the top of the terrace rises towards Overlook Hill.

On the lower level several claims are being worked to good advantage with the limited supply of water available. Five parties along the terrace face between the upper and lower roads are sluicing and breaking good ground, others are tunnelling and slabbing in anticipation of a better supply of water being laid on by the construction of the race. There is abundant tailing room on the flat at the foot of the terrace, and plenty of fall for the ground proposed to be sluiced. The promoters of the race have acquired the right to take 150 sluice-heads of water from the lake, eighty of which it is proposed to convey to the terrace by means of the race. Grimmond and Company have a special claim of 100 acres at Handley's Dam, and they have also acquired the race constructed from it.

Mr. McFarlane says, referring to the auriferous nature of the terrace, "The bulk of this ground has been prospected by shafts sunk in various localities, some being over 150 ft. deep, and from information received from the miners who have sunk some of these shafts, as well as from prospects personally tried by myself, I am confident that the value of the dirt throughout the 1,300 acres for an average depth of 75 ft. may be taken at the low estimate of 4d. per cubic yard. This would give the value of the gold to be won £2,621,000 sterling."

Mr. Lord says, "The extent of auriferous ground commanded by the race is about 1,280 acres of deep ground in the vicinity of Back Creek, Rimu, and Brighton Terrace. Besides this, there is room for future extensions right down to the sea-beach."

Mr. Alexander Aitken says, "The area of auriferous ground in the locality referred to (*i.e.*, Seddon's Terrace) is not less than 1,250 acres, and future working will in all probability extend that area. A low estimate of the depth of the material, most of which contains gold, to be sluiced away on that area would be 75 ft. The quantity of material to be sluiced away would therefore be at least 121,000 cubic yards per acre." Again, "Besides the ground in the neighbourhood of Rimu, the proposed race will pass through a large and extensive belt of auriferous country between Lake Kanieri and the valley of the Hokitika River, portions of which are now being worked. There are workings at Butcher's Creek, Coal Creek, and right-hand branch of the Kanieri River, all of which are crossed by the line of race, and fair prospects have been obtained at Bluebottle Terrace. An area of more than 2,000 acres is commanded at this locality by the proposed race, and portions are known to be payable, and would be worked if water was available."

On the other hand, Mr. J. A. Smyth, who made the first reconnaissance-survey, does not give a very hopeful opinion of the scheme, both with respect to the area to be worked and the suitable position of the race. And Mr. H. A. Gordon, in the report on mines for 1893, says, "Water would have to be delivered at a height of 450 ft. above sea-level in order to command the working in this locality." By actual levels it is now shown, however, that it can be done at an elevation of 350 ft.

Beyond the foregoing opinions there appears to be no data of the depth of the auriferous gravel or of its value, Mr. McFarlane being the only one who reports having made a personal examination.

It appears to me that there is a large area of auriferous ground to be worked towards the sea from Rimu. I have, however, no reliable data, the opinion is based upon statements made by members of the Miners' Association and other reliable judges, which, although, perhaps, to a certain extent interested, I do not think should be altogether doubted. Opinions are very decided in the matter that if water is brought in profitable employment will be found for a large number of miners for many years; and, weighing the question in an impartial manner, I am of opinion that the construction of the race would be a desirable work in connection with a general scheme for water-conservation on this goldfield.

The final conclusion I arrive at is: Although the proposed race will not command the whole of the highest parts of the top of the terrace, there is a considerable area of auriferous ground for a distance of two miles and a quarter along the terrace to the southward of the Rimu Township that could be sluiced to advantage by water from the source in question; and that, after carefully considering the subject, I find there is no practical difference in the levels between Messrs. McFarlane, Lord, and myself, because my last barometer level of 50 ft. above the lake on top of the terrace agrees with their 350 ft. level at the race termination at Handley's reservoir, which is about 29 ft. below mine, thus showing our total fall of 79 ft. from Kaneiri Lake coincides.

At present a portion of the creek-waters are diverted into a race about three miles and a half from and 250 ft. above Ross Township, and 370 ft. above sea-level. The race runs on the left bank of the stream, and is served by a small rough catch-water dam or weir, about 7 ft. high.

Although the present supply is sufficient, a larger amount of water is required to work the claims during the dry season, and it has been for some time proposed to construct a high earthen dam on the same site if the locality is considered suitable. The catch-water weir has been placed in a narrow gorge, rock-bound, in the best available position in the creek, and the head-race carries at a minimum two Government sluice-heads continually day and night in the dry season, and in flood-time the creek is reported to run as much as 240 heads.

It is a rapid heavily-bouldered creek, with deep firm banks, and a considerable sum would have to be expended alone in preparation for the foundations of a strong dam. There is a fairly-flat open space free of timber at the back of the gorge, averaging about 5½ chains in width and 14 chains in length, and a dam 50 ft. in height would be required to impound the water with any serviceable utility at an average depth of about 20 ft. Looking up the gully on the left bank of the creek the rock is almost perpendicular, and outwardly appears to be sound, but on the other bank is loose and broken, and slopes away from the creek at about 1½ to 1. All this portion I think would require to be cleared away to the bed-rock, not only for the core, but for the foundation of the dam itself. From the left bank of the creek about 66 ft. of the dam would have a nearly uniform depth of 50 ft., then, probably, rising at an inclination of 1½ to 1 for 2½ chains, a mean depth of 25 ft., and a total length on the crest of 230 ft. Considering its size, however, it would be a comparatively inexpensive dam to construct, there being an abundance of good small gravel material and rock. The creek-bed rises rapidly at the back of the proposed reservoir, and a small temporary dam could be constructed and a service-pipe with a good pressure brought down to sluice in the material. The dam could be constructed approximately for, if there is no trouble with the foundations, £3,000.

With reference to reporting on the drainage of the Ross Flat, there appears to have been some misunderstanding in communicating by telegram from Hokitika, because to have made such an exhaustive examination as the importance of the subject requires would have involved at least a month's work, a proceeding I knew at the time the department did not contemplate, or would be likely to approve.

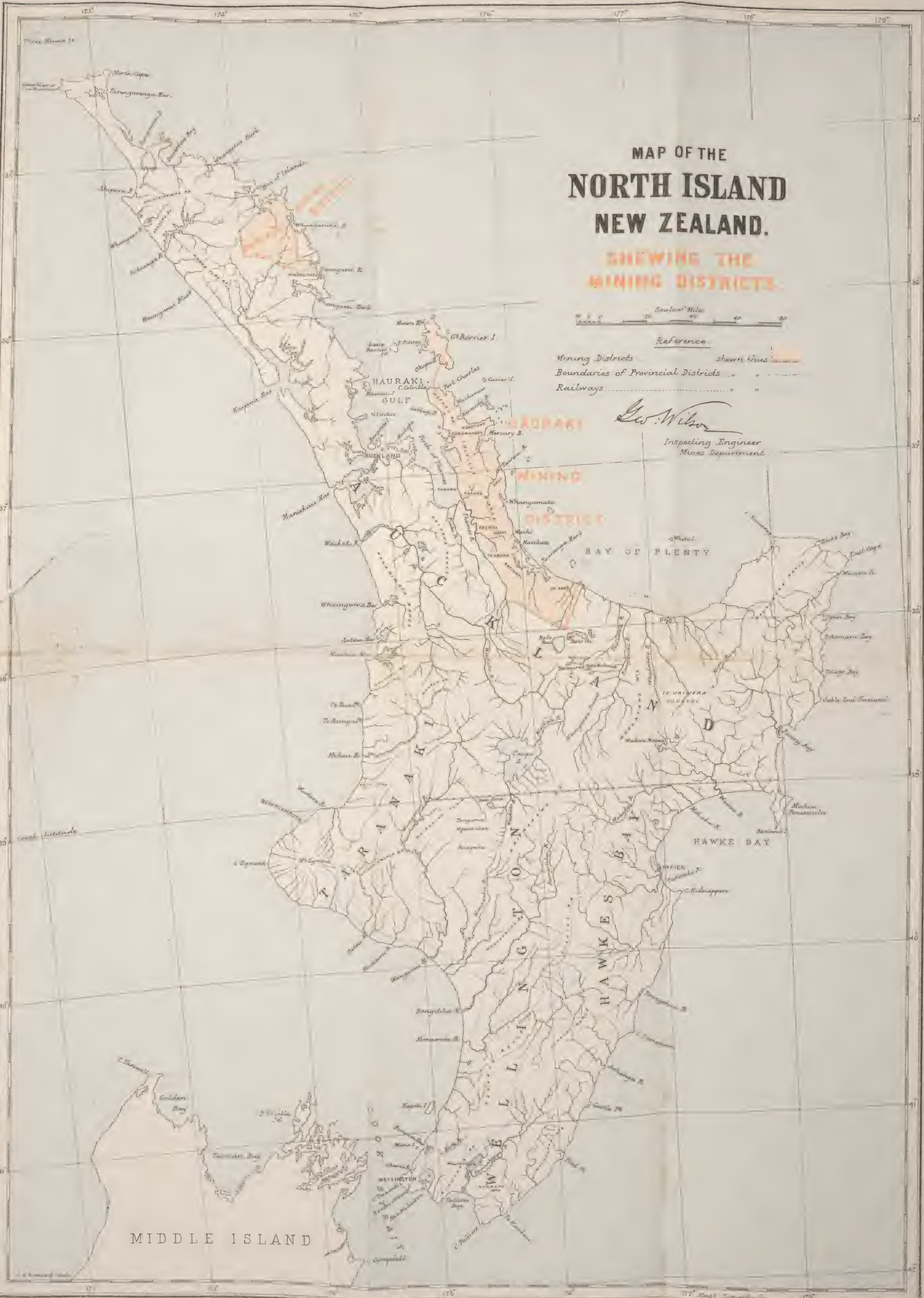
[Maps and diagrams explanatory of the letter-press accompany the report.]

The Secretary of the Interior of the United States has ruled that marble is a mineral within the meaning of the mining laws of California, and "therefore not subject to the selection of patent by a railroad company."

IMPROVED MINING PROCESSES.

The Bromine Extraction Process.

Of the various processes now before the mining world for the treatment of refractory ores the Gold-extraction and Bromine Recovery Company, whose works are situated in Worship Street, in the City of London, claim that theirs is at once the cheapest, the quickest, and the most successful, and, we may add, the latest. It has certainly been most favourably reported upon, amongst others by Sir William Crookes, F.R.S., Professor William Ramsay, F.R.S., Messrs. Johnson and Sons, Mr. Elwyn Waller, A.M., E.M., Ph.D., Mr. Peter T. Austen, Ph.D., Mr. Parker C. McIlhiney, A.M., Ph.D., Mr. Horace F. Brown, M.E., Mr. H. P. Walker, M.E., and Mr. F. I. Ricarde-Seaver, Assoc. Inst. C.E. In this process the roasted ore is leached in open tanks with a solution made by adding bromine to caustic soda. It has been proved that ores of varied composition, especially pyritic ores, may be thus treated without creating noxious fumes, and that fine crushing is not essential. Previous to leaching the ore is made slightly acid, and when the bromine lye comes into contact with the acid bromine is set free, and attacks and dissolves the gold as bromide. The bromine liquor is then run off and the ore washed. The liquor and washings enter a tank without coming in contact with the air, any combined bromine is liberated by the addition of a mixture of bromate and chloride of sodium and an acid, and the bromine is removed by a current of air, which is blown through the heated liquid. This air-current passes through a tower, down which a stream of caustic soda is descending, and the bromine is completely absorbed, and the solution is in its initial condition, which serves for second extraction. The blown liquor is mixed with a solution of sulphide of sodium, and the gold thrown down as sulphide; from this compound the gold is easily recovered in the metallic state by roasting and fusing. Tellurides, especially, can be successfully treated by this process, which has one advantage which will recommend it to mine-managers and mine-owners in Western Australia, that it consumes only a minimum of water. The experiments made by Sir William Crookes and Professor Ramsay show that an extraction of from 90 to 95 per cent. may be reckoned upon—a result which it would certainly be difficult to beat.—*British Australasian,* 14th October, 1897.



MAP OF THE
NORTH ISLAND
NEW ZEALAND.
SHEWING THE MINING DISTRICTS.

Reference.

Mining Districts shewn thus
Boundaries of Provincial Districts .. " "
Railways .... " "

Geo: Wilson
Inspecting Engineer
Mines Department.

The Beam Process.

A Colorado correspondent of the *Mining and Scientific Press*, San Francisco, furnishes the following description of the Beam roasting and converting process, as is demonstrated by the experimental plant erected in Denver by Steele, Bristol, and Co.: "The furnace is constructed of red brick, fire-brick, tiling, fire-clay, and cement, forming a series of air-tight muffles, 6 ft. by 6 ft. each, which in this plant are capable of roasting 500 lb. of ore at a charge. The roasting is done with a low degree of heat, and thus sulphides are converted into sulphates, leaving the gold in free condition. The roast is made for the first twenty-five or thirty minutes without air, during which time, it is claimed, the conversion takes place. Then a blast of hot air is introduced through pipes and valves arranged for that purpose. They further claim that before the hot air is introduced the product is in a condition which absolutely precludes the possibility of a loss by volatilisation, and that for this reason their roasted product usually shows values in excess of that indicated by assays of the raw material. It is necessary to crush the ore to a 40-mesh before roasting, and after the roast the product is reground to an 80-mesh. In this condition, it is asserted, the ore is ready for any method of amalgamation desired."

FIRING DYNAMITE BY ELECTRICITY.

At the Verbelia (Colorado) tunnel the dynamo used is located in the gulch 25 ft. from the mouth of the tunnel; wires are run into the tunnel connecting with the electric caps, which, when the current is turned on, explodes the dynamite. This electric cap, in construction, resembles an incandescent lamp, inasmuch as it has two wires leading into it with a filament of platinum, but it differs from the incandescent lamp filament in action; the filament in the lamp is strong enough to carry the current which makes it incandescent, and therefore gives out a steady light, but the filament in the cap is not strong enough to carry the current, but burns off, causing an electric spark to ignite the fulminating powder in the bottom of the cap and explode, thus exploding the dynamite. The wire and filament in the cap are held in place by sulphur, which is poured in while it is hot, thus making the cap waterproof. The dynamo, which connects by wires with a round of holes in the tunnel, has a pull-up or a push-down handle, which is connected to the armature by means of cog-wheels which cause it to revolve at a high rate of speed, thus generating a large quantity of current, which is held in the dynamo by means of a short circuit until the armature has gained its highest speed, when the short circuit is automatically broken, allowing the current to flow through the caps and causing them to explode.

This is a safe way of exploding dynamite, because the miner must get out of his shaft or tunnel before the current can be turned on, and, consequently, there is no danger of any of the shots going off prematurely or of any of them hanging fire; and, to be doubly safe, the miner can keep his dynamo locked and his key in his pocket.

ARBITRATION PREFERABLE TO LITIGATION.

As to the respective rights of owners of mining claims lying one above the other upon a stream or mountain, in Colorado in the case of a placer claim the owner of the claim lying above the other upon a stream must not allow the tailings from his sluice to wash down and be deposited upon the claim below. Though he is permitted to use the water of the stream for sluicing purposes, and is not liable for any damages for having muddied the same, without some prior claim other than that incident to the working of his placer he cannot divert the water from the gulch, or use it for other purposes to the detriment of claim-owners lying below. As to lode claims, the owner of a claim lying above another upon the mountain must not allow rock or water to pass from his workings down upon the property below so as to damage it in any way, or there will be liability. The owner of a claim lying below another, who provides drainage for both properties, in case both are being worked at the same time, can collect from the owner of the property lying above the proportionate cost of such drainage. A right-of-way is given across any and all claims to and from another for the purpose of hauling quartz. Generally the principle is that the owner of the location lying higher up shall not use the natural advantages of his location to the detriment of his neighbour below, and if he should do this he will be liable for the damages caused by his acts. To tell what the respective rights of each owner may be with any degree of certainty would require a knowledge of the facts in each particular case, and most miners should come to an agreement upon such matters. If each views the case from each other's standpoint they can usually agree upon what is right without becoming involved in litigation.—*Mining and Scientific Press.*

IMPORTANT MINING JUDGMENTS.

Gold-saving Machinery.

AT the Supreme Court, Auckland (in Banco), a special case with reference to Customs duty on imported mining machinery was brought on for hearing before Mr. Justice Conolly. The plaintiffs were Messrs. John Chambers and Son, merchants and importers of machinery, of Auckland, and the defendant the Collector of Customs, Mr. Rose.

The statement of case set forth that in the month of February, 1897, the plaintiffs imported into New Zealand for home consumption certain goods being parts of mining machinery, to wit, 50 forged shoes and 50 forged dies for crushing and pulverising purposes, of the total value for duty of £125 12s. 10d. The plaintiffs disputed the right of the defendants to charge and demand Customs duty on the said shoes and dies, and said that the same were exempt from the payment of such duty, on the ground that they wholly consisted of machinery for gold-saving purposes or processes, and were, therefore, exempt from duties of Customs under Class XII. "metals," in Schedule B to the Customs and Excise Duties Act, 1895.

The defence set forth that the use and purpose of the said shoes and dies were not exempt from the payment of Customs duty. The question before the Court was as to whether any and what duty was payable on the said goods, and on these points argument was heard.

His Honour delivered the following judgment: I am of opinion that my judgment in this case must be for the defendant. These shoes and dies merely operate to crush the ore, which, as far as I can understand, would not save any portion of the gold. The crushing of the gold and stone into powder would not save the gold at all. The commencement of the gold-saving process is by the ore amalgamating with the mercury. The crushing of the ore could have no effect in saving the gold, unless it were for the mercury. Judgment will be for the defendant, with costs, by consent, on the lowest scale.

A River-dredging Dispute.

In the case of the Molyneux Hydraulic Company *v.* Olof Magnus and others, being a claim for £100 on account of alleged deprivation of the defendants of the complainant's lateral support for their special claim, Mr. Warden McCarthy delivered the following judgment at the Warden's Court, Alexandra:—

This is a case wherein the complainant company alleges that it is the holder of a special claim license in respect of Section 1, Block XXI., Town of Alexandra, pursuant to "The Mining Act, 1891"; that the defendants, being the owners of a steam dredge, have by means of such dredge unlawfully encroached upon the before-mentioned section, have worked a considerable part thereof, and have extracted the gold from the parts so worked away. As an alternative cause of action the complainant company filed an amended statement of claim alleging that the defendants, by means of the before-mentioned dredge, have worked so close to the complainant company's special claim as to deprive it of its lateral support, and cause a great part thereof to fall down into the Molyneux River, whereby the gold therein contained became lost to the complainant company, and has been obtained by the defendants. At the hearing the company solely relied on their amended statement of claim. The facts are these: The complainant company is the holder of a special claim license originally granted on the 11th October, 1890, under the provisions of "The Mining Act, 1886." This license was surrendered pursuant to the provisions of section 187 of "The Mining Act, 1891," and a similar title issued in lieu thereof with priority as from the date of the original license. The land the subject of these two licenses (Section 1, Block XXI., Town of Alexandra) originally skirted along the north-eastern bank of the Molyneux River, but did not actually abut thereon. The defendants are the licensees named in a special claim license dated the 1st February, 1895, issued pursuant to "The Mining Act, 1891," in respect of Section 21, Block I., Fraser District. This latter section includes a part of the south-eastern bank of the Clutha River, as well as the river-bed lying to the south of Section 1. The action of the river had, before the commencement of the dredging operations of the defendants referred to, carried away portion of its north-eastern bank whereby the southern boundary of Section 1 became also a boundary of the river.

The defendants, before the commencement of their dredging operations, had pegged out and applied for a new special claim, including (*inter alia*) Section 21 and a spare piece of river bed between Section 1 and the latter section. This application is still pending, and states that the applicants will surrender the license for Section 21 as soon as the application is granted. It has been intimated by the Warden that the application will be granted subject to certain conditions not yet determined on. The defendants, during the time mentioned in the particulars of complaint, worked their dredge within the limits of the land at present under application, though not always within Section 21, at certain points distant from 2 ft. to 6 ft. from the southern boundary of the complainant company's special claim. This working of the dredge deepened the bed of the river. On the southern bank of the river there have been thrown out from claims on that bank, not owned or controlled by the defendants, two long strips of tailings extending some distance into the river. These strips have had the effect of directing the current of the river more against that part of the northern bank on which is situate Section 1, the complainant company's special claim, than was formerly the case. This fact, coupled with the deepening before alluded to, as well as the vibration of the dredge, has brought into the river a portion of the southern boundary of Section 1. Although each of the above causes has contributed to this result, there can be no doubt that had it not been for the dredging operations of the defendants the amount of soil displaced would have been infinitesimal. However, the soil so displaced fell into the bed of the river well within the limits of the complainant company's special claim; and, looking at the fall of the river, and the specific gravity of gold, no appreciable amount of either the auriferous gravel or the gold therein contained has escaped beyond the limits of the company's claim. Any gold which might have escaped (and there is no proof that any did escape) could not have been saved by any known appliances. Further than this, it has been abundantly proved that the surface soil of the company's special claim, which is of a loose sandy nature, contains little (if any) gold, which is chiefly contained in a layer of hard gravel cement upon which the current of the river could have little or no effect.

The complainant's special claim was originally worked by means of hydraulic sluicing; but at the time of the happening of the events on which the complainant company bases its right of action it had abandoned sluicing operations, and was engaged in building a dredge to work its special claim. The building of the dredge has since been completed, and, before the hearing of the case had been concluded, it was at work. To get at the auriferous gravel which lies on what is called the "bottom," the complainant company will either have to dredge or sluice away the sandy soil which lies on the surface. The defendants' operations, so far from hindering or impeding those of the complainant company, will, on the contrary, materially assist the latter in the work it will have to undertake before it can reach the auriferous gravel. The fact must not be lost sight of that the strip of ground which has fallen into the river within the limits of the complainant company's special claim was not at the time of the defendants' dredging operations directly adjacent to any land whatsoever. That strip was itself the north-eastern bank of the river. The sole ground of complaint, then, on which the company can base its alleged right of action against the defendants is that from the causes beforementioned a strip of land forming part of the complainant company's special claim has fallen into the river within the limit of that claim, and that thereby the complainants have lost no gold which they could have hoped to win, and have not been, and cannot in the future be, in any way impeded in any work they may choose to undertake for the purpose of winning the gold.

In short, the company is driven to base its right of action on a bare subsidence of a portion of land unaccompanied by any infringement of any of the rights to which it is entitled under its license. Can, then, a bare interference with the lateral support of any special claim held under "The Mining Act, 1891," unaccompanied by any such infringement, give rise to a right of action for damages and a claim for an injunction? The rights of the company under the license are defined by section 77. That section gives all special claims licenses, subject to the provisions of the Act, and during the currency of the several terms created by their respective licenses," an indefeasible right to all gold within the boundaries of the land comprised within the license, and an indefeasible and exclusive right to dig and mine for gold therein and thereon, and dispose of the same, to erect machinery on such land, and to construct works connected therewith, and to do all lawful acts incident or conducive to the carrying out of these objects."

Now, with regard to this right of support from adjacent land, it is laid down in "Goddard on Easements" (page 67, fifth editition) that "the law annexes the ownership of land a natural right that the landowner shall be entitled to sufficient subjacent and adjacent support for his ground to keep it in its natural condition and position." So also at page 59 of the same work it is further laid down that "the right to support is not a right to a particular means of support—as, for instance, if support has always been received from subjacent coal, that the coal, or a certain portion sufficient to sustain the superincumbent weight of the soil, shall never be removed; but it is right that the ordinary enjoyment of land shall not be interrupted, so that until the enjoyment of the surface is disturbed the owner has no right to complain of the removal of minerals. A number of cases are referred to in support of those propositions, and in all of them the constant element is that the person who has succeeded in his action has had invaded some right of user or some means of enjoyment incident either to the ownership or even the bare occupation of the land. These cases have been decided between (*a*) ordinary landholders; (*b*) miners and ordinary landholders; (*c*) miners and miners. And, even in the case greatly relied on by counsel for the complainant (The Great Extended Sluicing Company *v*. Hales, Macassey's Reports 896), the plaintiff company and the defendants were respectively owners of mining claims under "The Goldfields Act, 1886," and the latter had mined so close to the claim of the former as to cause a large portion thereof to fall in on defendant's claim. The defendant had thus invaded the exclusive right to mine held by the plaintiff company under the Act just cited.

It is further to be borne in mind that by the very terms of the license held by the complainant company in the present case it is not contemplated that the surface of the land will continue in its natural state. The very operations which both the company and the defendants propose to carry out will remove the whole or nearly the whole of the surface-soil from their respective claims. In so far, then, as special claims held under the Act of 1891 are concerned, actions founded on any alleged invasion of the right to lateral support must, from the very nature of things, and by analogy to the English authorities, be confined to those cases where any such invasion has resulted or might result in any deprivation, however slight, of the rights conferred on licensees by the statutes, with probable limitations wherever machinery has been erected by either of the parties to the action.

The initial test of liability in every case is not whether the land has been deprived of its lateral support, but whether there has been any invasion of the statutory rights of the licensee. Cases can easily be imagined, as, for example, of underground workings, where the maintenance of lateral support would be all-important, but to decide in every case of subsidence of lands held under special claim licenses, unaccompanied by any infringement of the statutory rights of the licensee, that an action would lie, would be not only to aim a deadly blow at the mining industry by fostering fruitless litigation, but to depart from the analogies suggested by the English authorities. Inasmuch, then, as any subsidence that has taken place owing to the operations of the defendant's dredge has been unaccompanied by any invasion of the statutory rights of the complainant company under their license, judgment must be recorded for the defendants. Judgment accordingly, with £10 10s. counsel's fee; disbursements and witnesses' expenses, £7 12s.

In re an application by Samuel Crow for a licensed holding in respect of 20 acres, including a portion of the Kawarau River and banks thereof. Objected to by B. Macpherson.

The facts were as follows: The applicants had pegged in 24 acres, whereas their application mentioned only 20 acres. One bank of the river within the applicant's pegs, measured along its various windings, was 7 chains more than a mile, whilst the other bank, measured in the same way, was 1 chain over that length. Measurements, however, taken up that part of the centre of the bed of the river within the pegs, gave the length as less than a mile. It is an unvarying custom amongst surveyors, whenever they wish to ascertain the length of the bed or banks of a river, to take their measurements up the centre of the river-bed.

The objector contended as follows: (*a*) That pursuant to Regulation 217 he was entitled to the surplus over the 20 acres mentioned in the application measured from any two corner pegs. (*b*) That in any event the applicants had pegged in more than 1 mile of a river bank, and there must be deducted 7 chains off the one bank and 1 chain off the other. (See section 30 of "The Mining Act, 1895.")

The Warden decided as follows: (1) That the land which the applicant was entitled to have granted to him was, in the absence of fraud, all the land within his pegs, notwithstanding that such last-mentioned land exceeded the area mentioned in his application, provided that that area did not exceed the area which could be granted as a licensed holding. (2) That Regulation 217 did not apply to areas under application, but only to areas in respect of which a title existed either by occupancy alone or by occupancy coupled with registration. (3) That in computing the mile mentioned in section 30 of "The Mining Act, 1895," measurements must be taken down the centre of the river-bed.

The objections were disallowed and the application granted.

Surveyors' Charges.

At the Warden's Court, Dunedin, a question about surveyors' fees was raised in an application made under section 132 of "The Mines Act, 1891," by David Cameron Simson to tax survey-charges on a licensed holding. The Chief Surveyor, as provided by Regulation 22 of the 24th September, 1896, forwarded a voucher in favour of the surveyor who did the work, in which he certified the distance as 55 miles, that being the distance from the surveyor's residence in Dunedin to the claim by the nearest public road suitable for travelling in a wheeled vehicle with survey-party and camp-equipage. Counsel for the objector contended that "road" in Regulation 21, c. 6, included railroad, and that as there was a railroad to within about 4 miles of the claim, the mileage should be allowed by that route, making the distance about 32 miles only.

Mr. Warden Carew, in giving judgment, said that words in Acts of Parliament or regulations must be taken in their ordinary and popular sense; that the words "nearest road" meant a road by which a survey-party and their equipage could travel all the way to the land to be surveyed, and would not include a railway by which the party could travel only part of the distance; and he upheld the Chief Surveyor's certificate in respect to mileage.

VENTILATION OF MINES.

THE following are the conditions under which applications for the bonus of £1,000 offered by the Victorian Government for an efficient system of mine-ventilation will be considered:—

(1.) Any application for the bonus must be made to the Minister for Mines before the 1st day of January, 1898.

(2.) The applicant will be required to demonstrate his system or systems of ventilation and appliances practically in some mine or mines in Victoria, to be approved by the Governor-in-Council.

(3.) Any such system or systems must comply with the provisions of section 135 of "The Mines Act, 1897," under any atmospheric conditions.

(4.) The air supplied by any such system or systems and appliances to each and every part of the mine where men or horses have to pass, or where work of any description is being carried on by men or horses, shall be equal in purity to the fresh outside air at the surface of the mine.

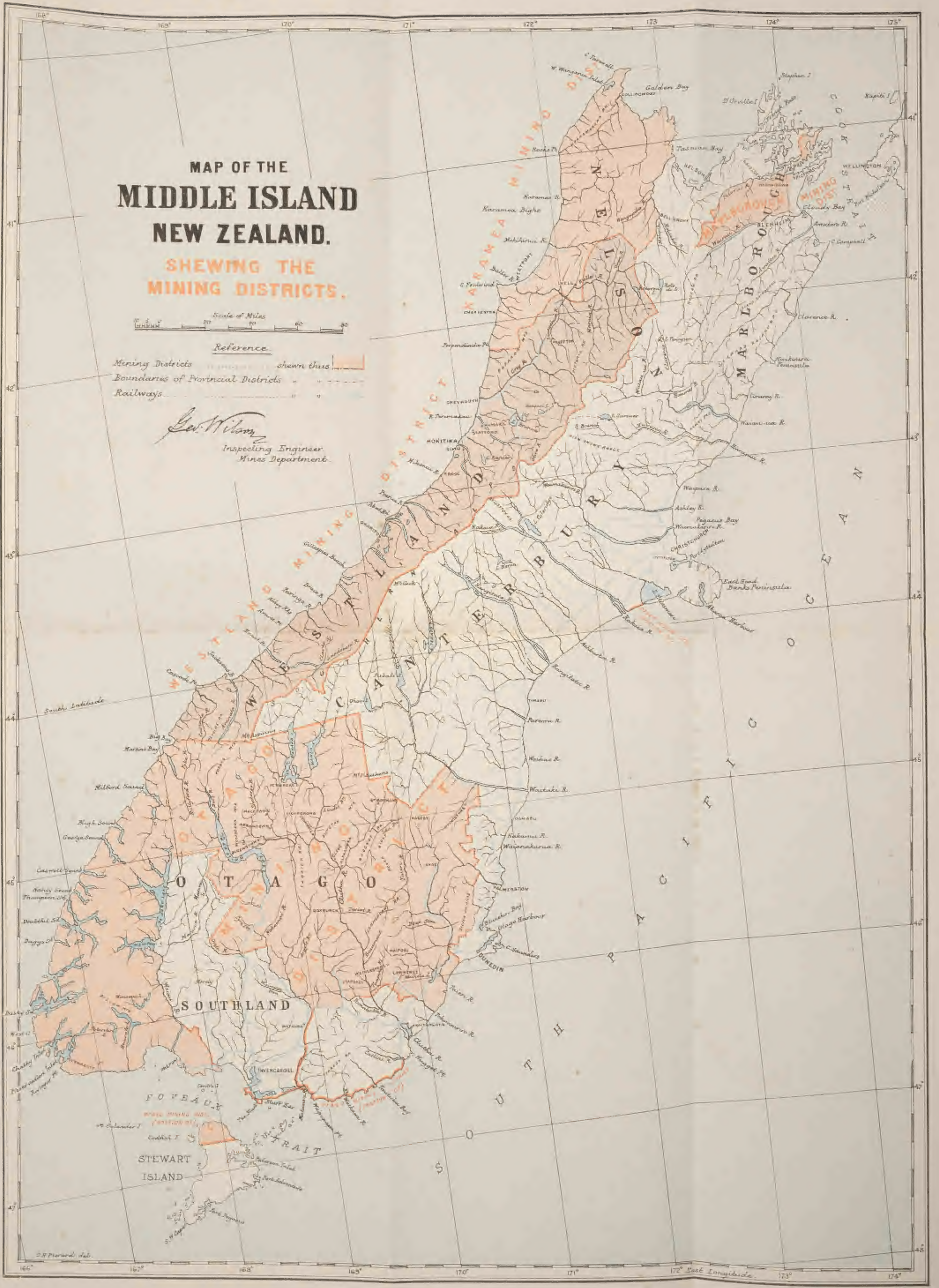
(5.) The system or systems and appliances shall not be of such a character as, by the cost of erection and the cost or expense of working, to be prohibitive of profitable mining.

(6.) The full bonus may be awarded to a system and appliances if applicable to the ventilation of deep alluvial, coal, and quartz mines; or the bonus must be awarded in such proportions as their relative merits may justify to a system or systems and appliances only applicable to deep alluvial, or to coal, or to quartz mines, or to any two thereof.

(7.) No system and appliances will be considered in which the principle involved in ventilation is not novel, or in which there is not the novel application of known principles or methods.

(8.) An applicant to whom any bonus is awarded under these conditions will not be permitted to patent his system and appliances in Victoria; no system and appliances will be considered for which a patent has been applied for or patent rights have been granted in Victoria, unless such application be abandoned, or such rights be resigned as regards Victoria.

By Authority: JOHN MACKAY, Government Printer, Wellington.



MAP OF THE
MIDDLE ISLAND
NEW ZEALAND.
SHEWING THE MINING DISTRICTS.

Scale of Miles

Reference

Mining Districts shewn thus
Boundaries of Provincial Districts " "
Railways " "

Geo. Wilson
Inspecting Engineer.
Mines Department.

The New Zealand Mines Record.

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EXAMINATION FOR MINE-MANAGERS' AND BATTERY-SUPERINTENDENTS' CERTIFICATES.

Mines Department,
Wellington, 3rd November, 1897.

An Examination of Candidates for Certificates as First- and Second-class Mine-managers and Battery-superintendents, under "The Mining Act, 1891," and Amendment Act, 1894, and First- and Second-class Mine-managers under "The Coal-mines Act, 1891," will be held on Tuesday, the 25th January, 1898, and three following days.

T. H. HAMER,
Secretary to the Board of Examiners.

THE NEW ZEALAND MINES RECORD.

Advertisements in reference to mining machinery, dredges, drills, explosives, pumps, electrical apparatus, or anything connected with mining, will be received at the scale of charges annexed; also professional cards from assayers, mining engineers, surveyors, &c.

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